RAILROAD GAZETTE

FRIDAY, SEPT. 26.

The table of contents will be found on the editorial page.

The St. Clair Tunnel.

The St. Clair Tunnel has now passed beyond the experimental stage and there is no longer any doubt of its successful completion. The excavation is done and the iron lining in. The work which remains is to complete the open cuttings for the approaches, to put in the brick lining, floor system and track, and build the masonry of the portals. All of this is mere detail, which can now be pushed with great rapidity. The actual boring of the tunnel was begun with grave apprehension and carried on with constant anxiety. The work was largely experimental and almost unprecedented, for although the City & Southwark Tunnel in London was under way, it was but about half the diameter of the St. Clair Tunnel. Nothing of anything like the magnitude had ever been done by the same method, and the limited experience with the method could indicate neither the emergencies which might arise nor the means of meeting them. The work, being so experimental, was prosecuted with great caution, and that is why the open cuttings are not so far advanced as the tunnel itself. It was considered prudent not to put into the venture any more money than was absolutely necessary until its success was certain. Now success is certain, and the whole work will at once be pushed to completion.

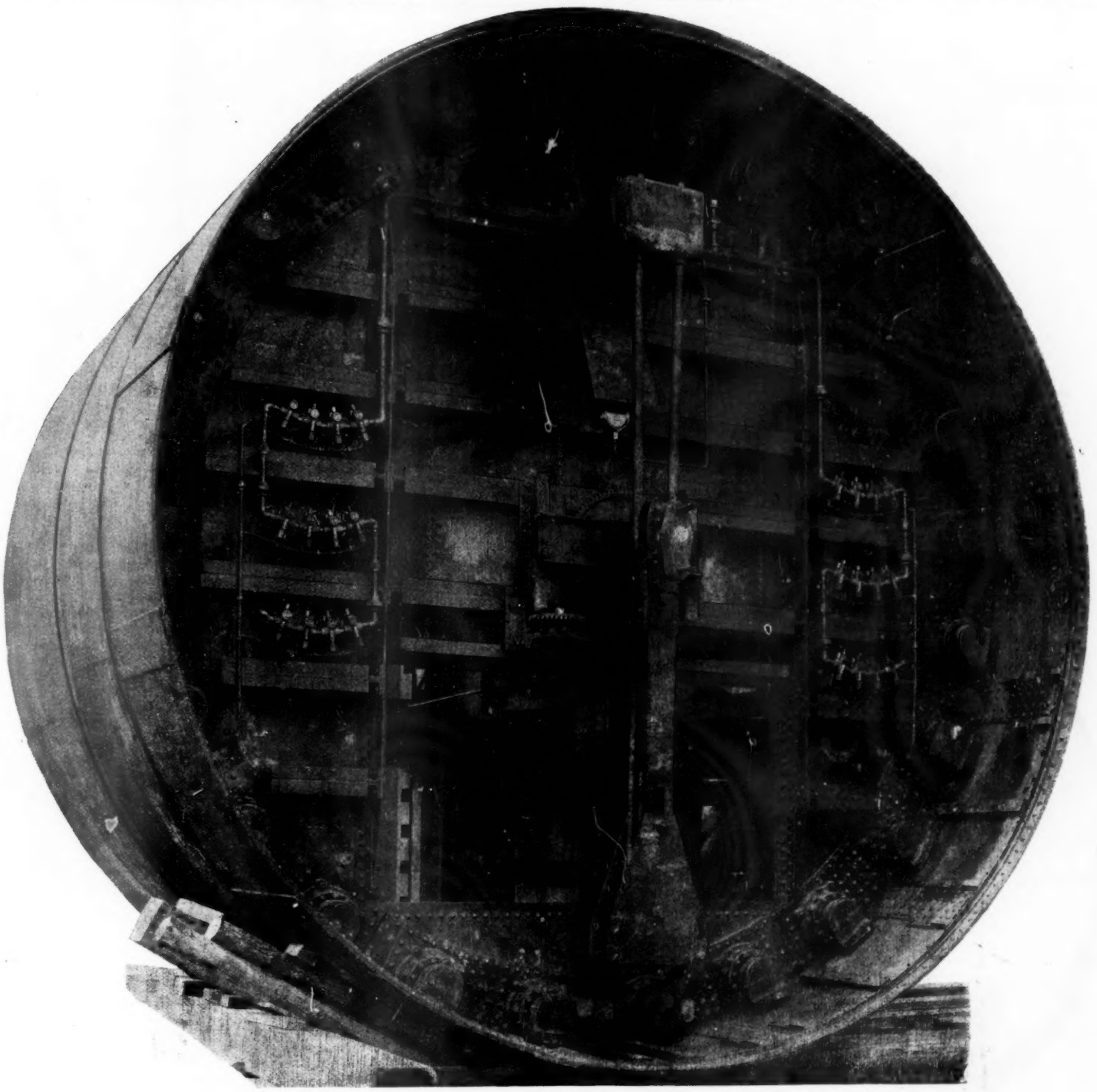
It is our purpose to describe briefly a work which, by its originality and by the speed and success with which it has been carried on, is a monument to the men who planned it and have done it. We shall speak of the history and organization of the work, its dimensions, the material in which it was done and the manner of doing it.

The shortest route of the Grand Trunk from deep water to Chicago and to Lake Michigan ports crosses the St. Clair River from Point Edward to Fort Gratiot, 61 miles above Detroit. By this route it is 837 miles from Montreal to Chicago and 1,134 miles from Portland to Chicago, all by the Grand Trunk lines. By the southern route, crossing the river at Detroit, the distance is greater, and the traffic between Chicago and Detroit must either pass over the Wabash or make a détour to the northward by Durand, still further increasing the distance. For these reasons, if for no others, the main crossing of the Grand Trunk is at the south end of Lake Huron rather than at Detroit. The heaviest of its traffic now goes that way, and it is expected that on the completion of the tunnel much of the traffic now crossing at Detroit will be diverted to Port Huron and Sarnia.

Crossing by ferry is costly and slow. The stream is one-half to three-fourths of a mile wide, the current is six to eight miles an hour, and in the winter there is much trouble from running ice. The project of constructing a tunnel has been more or less agitated for many years.

Probably it would be impossible to allot accurately to several individuals their proper share of credit for the conception, organization and financial arrangement. In 1880 Sir Henry Tyler suggested a tunnel between Point Edward and Fort Gratiot, and since that time the matter has been more or less discussed. Sir Joseph Hickson was also one of the first to seriously press the scheme, and in 1883, at his request, Mr. Walter Shanley made an examination and reported in favor of a tunnel.

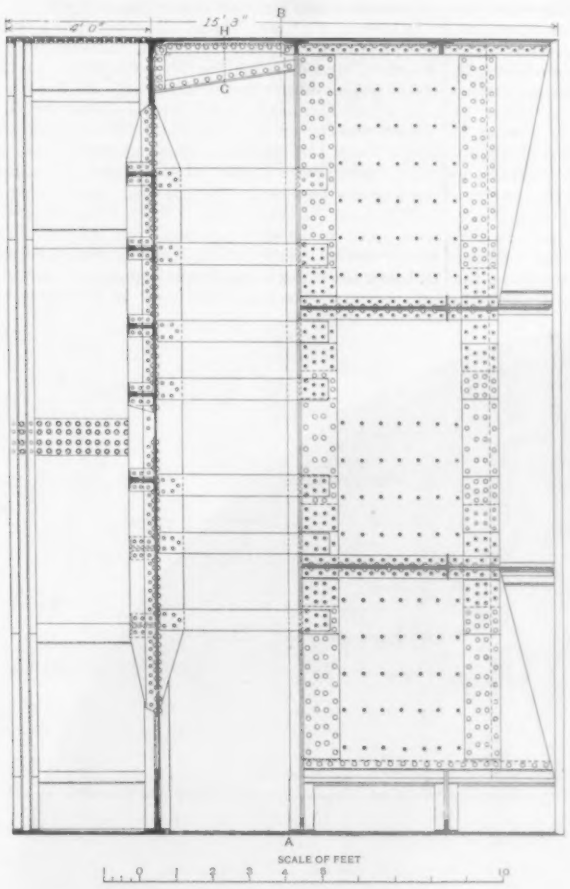
In 1886 the St. Clair Tunnel Co. was formed, with Sir Joseph Hickson as President, Mr. L. J. Sargeant, Traffic Manager, Grand Trunk, as Vice-President, and other Grand Trunk officers in the directory. Mr. Joseph Hobson, Chief Engineer Great Western Division, Grand Trunk, was chosen Chief Engineer. Borings had shown a stratum of soft blue clay throughout the whole course of the tunnel, with pockets of gravel and quicksand and more or less boulders. The greatest depth of water is 40.47 ft., and the clay is about 50 ft. deep; below this is rock. Above the clay lies sand and gravel 5 to 25 ft. thick; the lowest dip of the gravel stratum being 48.4 ft. below the water level. Pockets go down much deeper into the clay. The top of the rock is 85 to 90 ft. below the water level. It was decided to drive the tunnel through the blue clay, and the top of it is 57 ft. below the water level at the lowest dip in the grade.



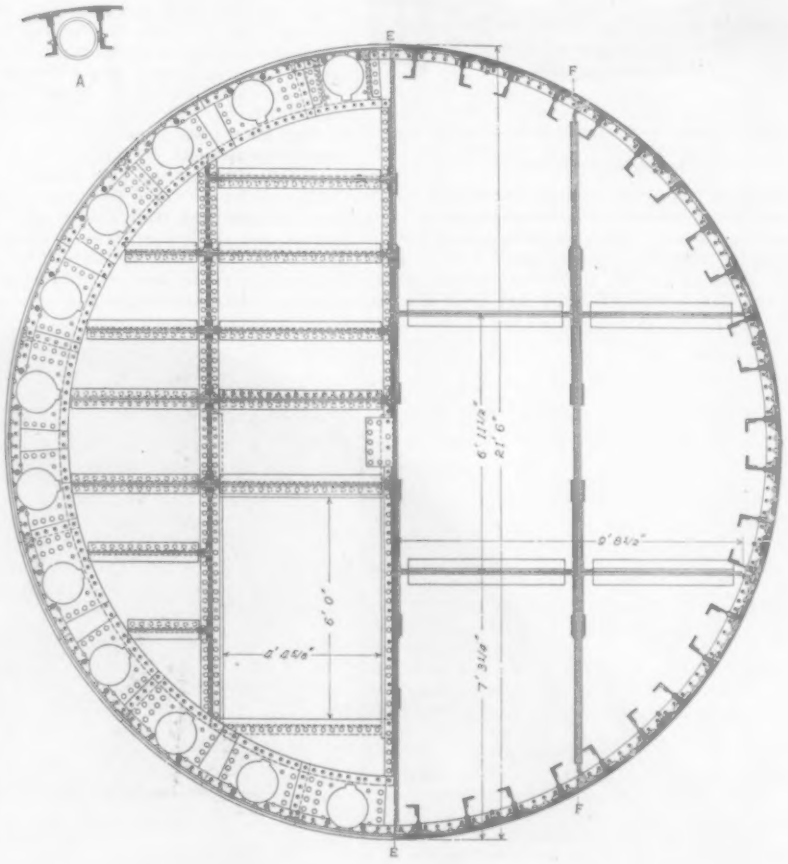
THE ST. CLAIR TUNNEL—VIEW OF BACK OF SHIELD. FROM A PHOTOGRAPH.

The site chosen is just below Sarnia and Port Huron and about three miles below the present ferries. The line is almost due east and west. The excavation consists of an open cutting on the American side of 2,500 ft., the tunnel, 6,000 ft., and an open cutting on the Canadian side of 3,100 ft., or 11,600 ft. in all. Of the tunnel 2,290 ft. is under the river, 1,994 ft. from the river to the cutting on the Canadian side and 1,716 on the American side. The gradients are shown on the profile herewith, viz., 2 per cent. at either end for 1,900 and 2,400 ft. and one-tenth of 1 per cent. for 1,700 ft.

In 1888 work was begun by sinking shafts on both sides at the river edge, from which to drive the headings. On the American side the shaft was sunk 58 ft. and on the Canadian side 98 ft. Both were then abandoned. The skin friction of the tough clay on the American side



Section showing walls E and F.



Half End View. *Half Section at A B.*

Fig. 1—Details of Shield.

(A = Section of Bracket at G H, showing Ring for End of Jack.)

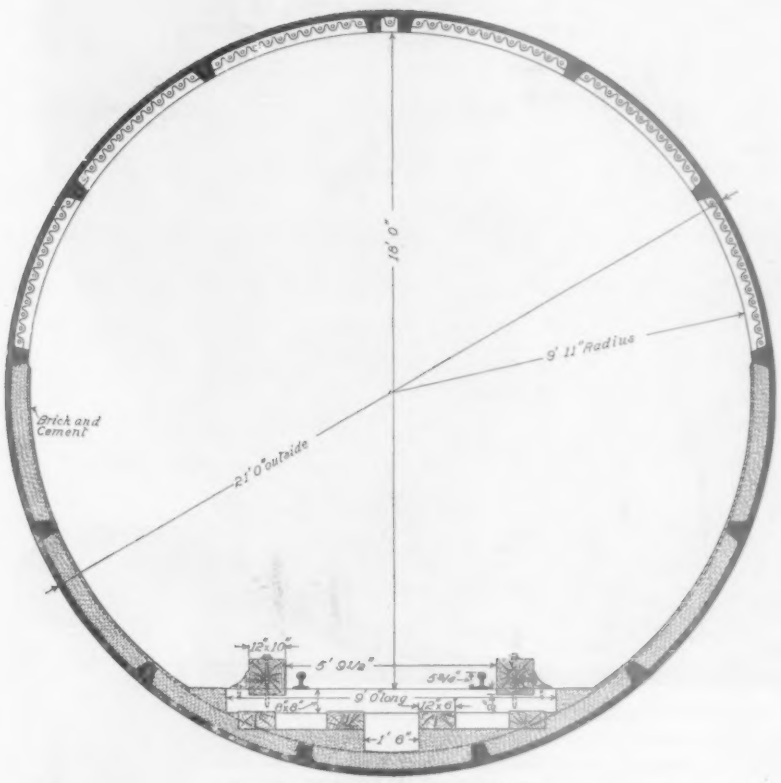


Fig. 2—Section of Completed Tunnel.

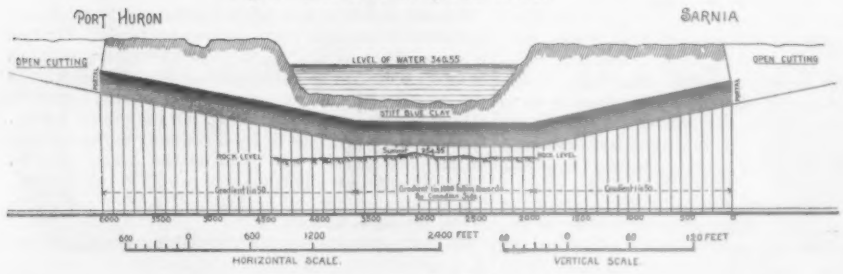


Fig. 3—Profile.

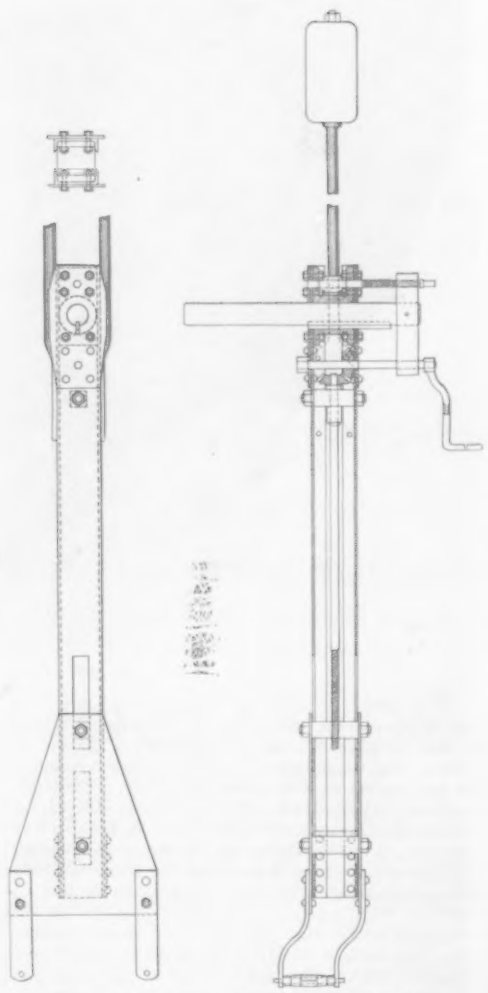


Fig. 4—Hoist for Placing Segments of Lining.

THE ST. CLAIR TUNNEL.

prevented the descent of the cylinder, and on the Canadian side the extreme pressure deformed the cylinder, the clay began to rise in the bottom, and collapse of the entire structure was threatened. Then it was decided to abandon the shafts and work from open cuttings, with but two headings. In January, 1889, the cuttings were begun. July 11, 1889, the shield was started from the American side and Sept. 21, 1889, from the Canadian side. Aug. 25, 1890, communication was made between the headings, and Aug. 30 the shields met. In just a year 6,000 ft. of tunnel had been excavated and lined; 80,000 cu. yds. of material had been removed. The table herewith shows the progress by months in feet of tunnel excavated and lined:

	Canadian end.	American end.
July, 1889	.....	53 ft.
August, 1889	.....	114.50 "
September, 1889	73.30 ft.	153.70 "
October, 1889	169.45 "	126.75 "
November, 1889	187.50 "	225.50 "
December, 1889	217.40 "	266.91 "
January, 1890	292.35 "	277.50 "
February, 1890	306.08 "	273.67 "
March, 1890	292.50 "	303.63 "
April, 1890	281.34 "	182.20 "
May, 1890	97. "	355.54 "
June, 1890	236.83 "	354.46 "
July, 1890	201.30 "	382.30 "
August, 1890	331.05 "	314.10 "

The work was done in open tunnel until the river edge was reached. Here on each side a diaphragm was put in with air locks, and all the work under the river was done in compressed air. The pressure was at first 10 lbs. per square inch above atmospheric, and at the completion it was 23 lbs. At intervals much greater pressure was used, running up to as much as 40 lbs., at one time. There were two complete air-compressing plants on each side, furnished by the Ingersoll-Sergeant Rock Drill Co., and consisting altogether of four, class "A" straight line, Ingersoll-Sergeant air compressors, steam and air cylinders 20 in. diam. × 24 in. stroke; six 70 horse power; four air receivers, each 48 in. diam. × 144 in. high. The compressors have the automatic regulation, by which the air pressure is kept uniform, and the engine is unloaded should the consumption of air diminish or cease, only enough steam being used to keep the engine turning.

Generally speaking, there was little difficulty, but there were short periods of great anxiety, and when, in fact, the success of the work seemed in doubt. These were when pockets of quicksand or gravel were encountered, and the air blew out in the river bottom. The escape of air was finally sufficiently arrested by plastering with clay to enable enough pressure to be carried to keep out water, and the shield was carried on through the loose material. At times something of the same difficulty was experienced, because of the extreme softness of the clay. Another source of trouble was in the large boulders encountered. These could not be blasted, on account of the gas in the tunnel, and had to be split by plug and feather. Mr. Hobson tried to get some means of detecting chemically the presence, in dangerous quantities, of explosive gas, but found none, and was compelled to rely upon the indication of the flame in the Davy lamp.

The manner of carrying on the excavation in this tunnel is now pretty well known in general terms. The excavation was done in circular shields, forced forward by hydraulic jacks, and the shields were at once followed up by the permanent cast iron lining of the tunnel. The shields are shown in figs. 1 and 5 and will be described further on. In these shields the men worked, cutting down the clay and throwing it back, when it was taken up by the "muckers" and run off in small cars. These cars were hauled by mules in the compressed air and by horses outside. It was found that horses could not live in the compressed air. The men worked night and day in 8-hour shifts, and as a rule suffered no lasting inconvenience from the compressed air. There were three deaths from its effects, and several cases of partial paralysis, and more of the characteristic affection known as "the bends." Occasionally a mule also suffered from "the bends." The shields were forced forward by hydraulic rams. Of these there were 24 to each shield, with a capacity of 125 tons each, or a total of 3,000 tons for the shield. The greatest power ever used was 1,800 tons, and generally 1,200 to 1,500 tons was sufficient. The shields were designed by Mr. Hobson, and were built at Hamilton, Ont., by the Hamilton Tool Manufacturing Co., from plates imported from the United States.

The hydraulic machinery was made by Messrs. Watson & Stillman, of New York City, and the illustrations and description of that part of the work are from drawings and memoranda furnished by them. Messrs. Watson & Stillman, under the old firm name of E. Lyon & Co., designed and built the hydraulic parts of the original Beach shield which was used in the excavation of the short pneumatic railroad built under Broadway, New York City, in the year 1868. Since that time the same firm has furnished plants of the same form in its essential features for various works, but nothing of the magnitude of the St. Clair Tunnel plant, which also is novel in the automatic feature by which the ram is withdrawn from contact with the finished part of the tunnel.

The method of building the tunnel, using the cast iron cylinder as the backing from which the shields are forced forward by the rams, necessitated putting the rams as near as possible to the exterior circumference of the tunnel, and making them occupy a minimum of space.

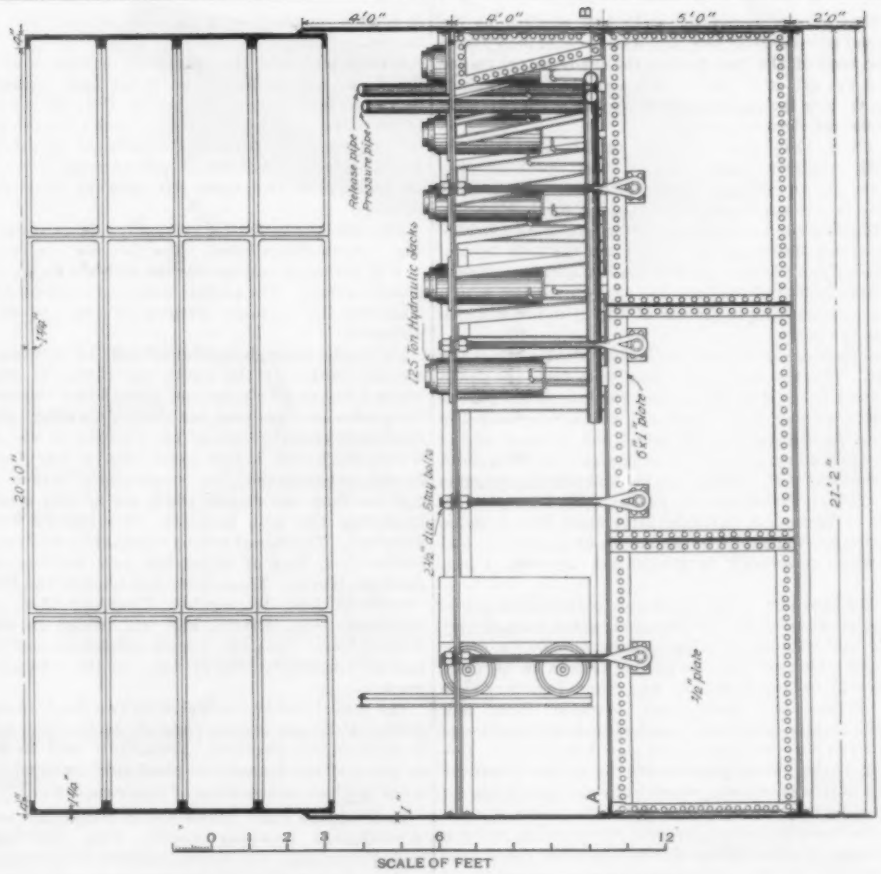


Fig. 5—Section of Shield showing Arrangement of Rams.

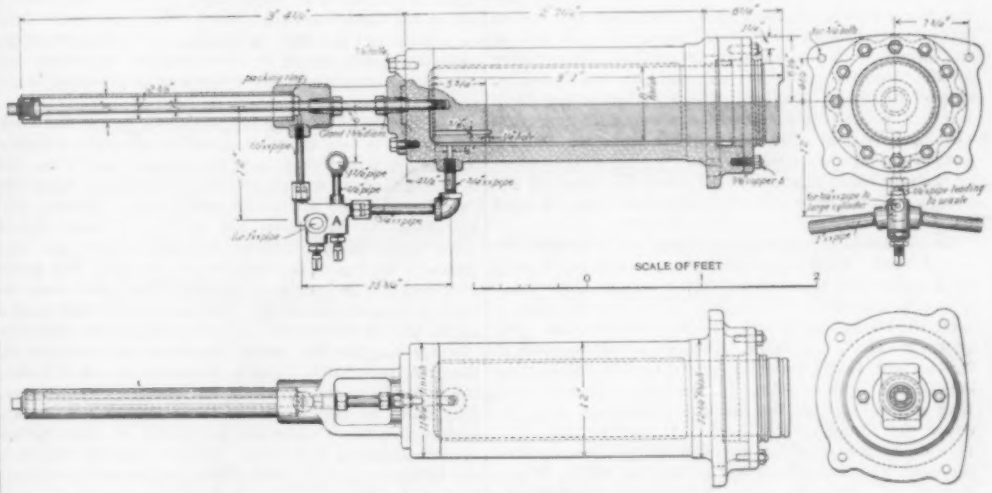


Fig. 6—Details of Rams.

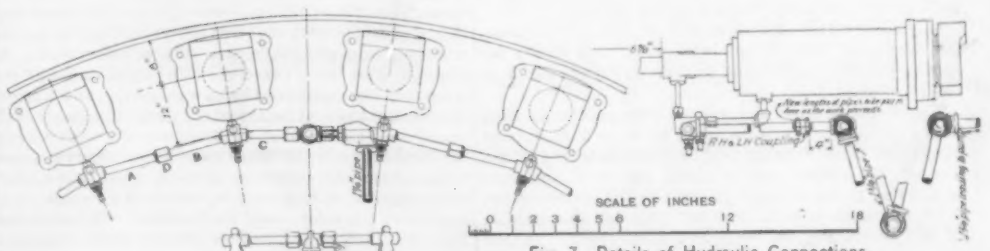


Fig. 7—Details of Hydraulic Connections.

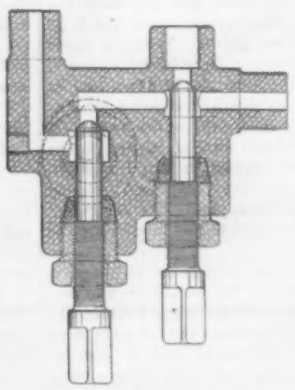


Fig. 8—Detail at A, Fig. 7.

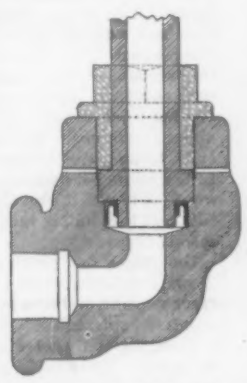


Fig. 9—Detail of Swivel Joint.

THE ST. CLAIR TUNNEL.

For that reason, especially, steel was adopted as the material for the cylinders, and a steel collar was placed on the head of the ram to take the entire thrust on one side of the axis of the ram. This arrangement is shown in fig. 6. For the same reason the yokes of the cylinders were cut off close, as shown.

In order that the cylinders might be easily repacked, without inconvenience, the ram head was screwed on the ram and attached to it by a screw, not shown in the engraving; and a gland for holding the packing in place was attached to the cylinder by copper bolts, this metal being used to prevent the nuts becoming fixed. The return cylinders were attached, as shown, to a yoke, bolted at the back end of the cylinder, with a gland with packing in the end of the cylinder, and also one on the yoke.

Each jack could be operated independently of all the others. This feature made it possible to drive the shield in correct line. If the resistance was less on one part of the circumference than elsewhere, or if it was desired to change the direction of the shield, one or more of the rams could be cut out, or the force exerted by them could be reduced at will. The pumps used for driving the rams were 12-in. cylinder, duplex pumps, with 1-in. pistons, made by Watson & Stillman, after their own designs, the pumps being placed at the mouth of the tunnel, and the water conveyed to the shield through 1¼-in. pipe.

At the back end of the shield were placed three swivel joints, made as shown in the cuts, which worked very easily, and without allowing leakage, at 5,000 lbs. pressure, and which are believed by the makers to be more successful in operation than any others that they have ever known of. These have between them half lengths of pipe, so that as the tunnel is advanced one full length after another can be placed in the line. Following in the line of pipe beyond the swivel joints are placed valves as shown, which have the side holes for connecting the various cylinders placed at a correct angle to make straight connections, each valve having two stop valves, one of them having its seat below the connecting line of pipe, so that a stream of water can be forced around the circumference without being driven into any of the cylinders, if the cock is closed. Above this seat is made a connection with the return cylinder, so that this is entirely automatic. (See fig. 6.) The other cock shown has a seat below the connection, leading to the pipe of the large cylinder and opening into a 1¼-in. line of pipe for the waste water, which also encircles the tunnel inside of the line of cylinders. These cylinders are 24 in number in each shield, and with a power of 125 tons each, making a total of 3,000 tons working pressure. The by-pass or passage, shown in the ram, prevents the motion of the ram being so great as to allow the head of the return cylinder to come into contact with the yoke and break the return piston, or crush the yoke.

As we have said above, the shields were designed by Mr. Hobson. He had practically no precedents, the only drawings which he could get being the small diagrams given in Drinker's "Tunneling." The construction is well shown in fig. 1 and the perspective view. The plates are steel, 1 in. thick. The exterior diameter is 21 ft. 6 in. and the cylinder is braced by five diaphragms dividing it into 12 cells. In front the shield has cutting edges, and at the back it prolonged 4 ft. to cover the lining of the tunnel. It will be seen that two doors are provided through which the excavated material was passed back to the cars on which it was hauled out. These cars were lifted bodily by derricks and dumped on the cars which hauled the material away. The derricks which handled all the material were worked by Lidgerwood winding engines.

The stroke of the hydraulic rams was 26 in.; in practice the shields were driven forward at each stroke far enough to admit one ring of the tunnel lining, which is 18¼ in. wide.

The tunnel is lined throughout with cast iron. This lining is shown in section in fig. 2. It is 21 ft. outside diameter. Each ring is 18¼ in. long, measured on the line of the tunnel, and is made up of 13 segments and a key piece dropped in on the top of the circle. Each segment is 4 ft. 11⅛ in. long on the outside of the curve, 18¼ in. wide and 2 in. thick. It has flanges all around 7 in. deep. The circumferential flanges are 3¼ in. thick at the base and 2¼ in. at the point. The longitudinal flanges are 3 in. thick at the base and 1⅝ in. at the point. Through these flanges pass ⅞-in. bolts with hexagon nuts and washers. On each side of the segment there are 12 bolts, and on each end four. Each segment weighed about 1,050 lbs., and the total weight of the cast-iron in the tunnel is about 27,000 tons. The segments were all planed on the ends, heated, and, while hot, dipped in liquid asphalt. In the joints between the segments were placed strips of wood, $\frac{1}{16}$-in. thick, also dipped in asphalt. It was against this cast iron lining that the rams thrust in moving the shields forward.

The crane for putting these segments in place is shown in position on the back of the shield in the perspective view, and also in some detail in fig. 4 It hardly requires explanation. It will be seen that it swings on a shaft in the centre of the shield and is counter weighted. By suitable gearing the segment is swung up to the place that it is to occupy and then thrust out by the bevel gear and screw shown in fig. 4.

Two complete electric light plants run by Armington & Simms engines were installed at each end of the tunnel.

A cross-section of the completed tunnel is shown in fig. 2. It will be lined with brick and cement to a line a few inches above the centre line. This is simply to cover the flanges and bolts and give a smooth interior for better security in case of derailment or other accidents. Grouting was forced out through holes left in the lining to fill any space left between the lining and the clay.

The rail is to be 100 lbs. per yard, laid on squared ties 8 in. × 8 in., 14 in. centres. The ties rest on four 12 in. × 6 in. stringers and outside the rails are 12 in. × 10 in. guard timbers. The portals will be of handsome ashlar masonry, the entrance circular in form and 20 ft. in diameter.

The traffic through this tunnel will be very heavy for a single track. At the outset there will be about 70 trains a day of all classes, including heavy freights, and the grades are 2 per cent., or 105.6 ft. per mile. It is not impossible that the limit of the capacity of the tunnel will be reached in a few years; but it was found by careful estimates that two single-track tunnels would cost less than one double track, as in this method of tunneling the cost increases very rapidly with the diameter. The tunnel will be operated by decapod, tank locomotives, four of which are now building at the Baldwin Works. These were described in the *Railroad Gazette* of Sept. 12, page 633. They have 22-in. × 28-in. cylinders, 49-in. drivers, and will weigh in working order 90 tons. They are to burn anthracite coal or coke and are intended to haul 760 tons on the two per cent. grades.

The tunnel will be ventilated by two Root blowers of 10,000 cu. ft. per minute capacity each, which are now in position and operation. Probably it will be lighted by electric arc lamps, the plant now installed for the work of construction being of ample capacity.

The drainage plant consists of a compound, vertical, Worthington pumping engine with double-acting, packed plungers. The water cylinders are placed at the bottom of a pit 125 ft. below the steam cylinders. The daily capacity of this engine is 5,000,000 gallons. The drainage to be provided for should be comparatively little as the lining is water tight. It will be pumped out at the Canadian end, toward which the tunnel dips on a grade of 1 in 1,000. In addition to this permanent pumping plant, Henry R. Worthington furnished for use during construction four low service pumps of large size.

The method of keeping the shields in line as the work progressed is very interesting and its efficiency is shown by the facts that they were never more than ¼ in. out of line, and there was practically no variation when the shields met. The method adopted was as follows: Observations to determine the position of each shield were made daily. It was impracticable to get two points in the line of the axis of the shield. The point observed was the centre of the back face, and observations were made to see that this face was at right angles to the axis of the tunnel. There was no serious difficulty in extending the line before the bulkheads were put in, the principal trouble being in the condensation of moisture in the large stream of air brought in for ventilation. The mists at last became so dense that it was necessary to stop the ventilators for about an hour before each observation was taken. To carry the line through the bulkheads, at the ends of the compressed air chambers, a cast iron pipe 12 in. in diameter was put in each bulkhead on the centre line of the tunnel. At each end of this tube was an adjustable diaphragm with fine cross wires. The ends of this tube were fitted with hinged dead lights, provided with cast iron covers for their protection when the tube was not in use. When observations for position were being taken the iron cap at each end was removed; the outer dead light was opened, and a strong electric light placed outsideof the dead light inside of the compressed air chamber, to illuminate the cross wires in the diaphragms in the tube. Observations were then made to ascertain the positions of these cross wires which were adjusted, if necessary, by means of a transit placed outside of the compressed air chamber. The outer dead light was then closed, and an electric light suspended close to and outside of it, and the transit was moved inside of the compressed air chamber and put precisely in line with the cross hairs in the iron pipe, opening first the inner dead light. In this way the centre line was defined, as the result proved, with great exactness. The observations were invariably made on the naked wires in the tube to avoid the distortion of the line, which would have resulted from sighting through the glass dead lights. The levels were carried through the air locks.

An account of the tunnel would be incomplete without a mention of the men who built it. To Mr. Joseph Hobson belongs the credit which follows from a great and original work successfully done. The whole design is his in general, and in most of the details. The members of his staff to whom special credit belongs are Mr. T. E. Hillman, First Assistant Engineer; Mr. M. S. Blaiklock, Second Assistant Engineer; Mr. J. T. Eames, Mechanical Superintendent, and Mr. Thomas Murphy, Superintendent of Excavation. Mr. Hillman had charge of the surveys and setting out of the work and of lining in the shields as the work progressed. The method and success of that part of the operation have been described above.

Two-thirds of the castings for the lining were furnished by the Michigan Car Co., of Detroit, Mich., and the other third from the Grand Trunk shops at Hamilton. The castings were excellent, and were delivered promptly according to the contract, so that there was no delay from this source, as there might well have been, when the great quantity of this material is considered. The planers for planing the ends of these cast iron segments were furnished by Messrs. Manning, Maxwell & Moore, of New York.

The estimated cost of the tunnel complete was $3,000,000, but it is now thought that the cost will be less, but that it will exceed $2,500,000.

What we have written will enable the reader to get an intelligent idea of this great work as a whole; but it is one which should be made the subject of an exhaustive monograph as a novel and important example of successful subaqueous tunneling.

The Hudson River Tunnel.

Work is being rapidly pushed on the Hudson River tunnel from the New Jersey shore, and before long it will be resumed on the New York side also. The present condition is this: The New York excavation has been carried out 150 ft., or about 80 ft. beyond the bulkhead line. On the New Jersey side the tunnel is out 2,270 ft., of which 2,050 ft. is the old work lined with 2½ ft. of brickwork, and there is 220 ft. of new work lined with cast iron. In the old work there are some variations from true alignment due to movements of brickwork, etc., but with the new methods and cast iron linings the alignment is true.

The sections used for lining are 1¼ in. thick, with flanges 8 in. deep, and are 20 in. wide in the direction of the line of the tunnel. They are bolted together by 1¼-in. bolts spaced 8 in. apart. The shield used for advancing is equipped with 16, 8-in. hydraulic rams, working under a pressure of 3,300 lbs. per square inch, giving a total of 1,326¾ net tons on the shield. This was fully shown in the *Railroad Gazette*, March 14, 1890.

In the headings the men are at present working under 35 lbs. of air pressure per square inch, though as high as 40 lbs. has been in use. The tunnel is lighted by electricity under the Sawyer-Man system, and the lamps are giving perfect satisfaction.

No difficulty whatever is experienced from water leaking into the workings; in fact, the tunnel is so dry that ladies have walked into the first lock in street costume and with no special preparation whatever.

The work is being done on one single track tunnel only, which, it is expected, will be completed in about two years. This will be the first hole under the river, and the second tunnel will be commenced as soon as the first is done.

Recent Rail Joints.

At the late convention of the Roadmasters in Detroit five rail joints were selected for trial in track. They are the Weber, made by the Weber Railway Joint Manufacturing Co., New York; the Fisher "Bridge" Joint, made by the Fisher Rail Joint Works, Trenton, N. J.; the Long Truss Joint, made by the Long Truss Rail Joint Co., Chicago; the Cloud Double Angle or Girder Truss Joint, made by the C. H. Dunham Railway Equipment Co., Chicago, Ill.; the Continuous Rail Joint, made by the McConway & Torley Co., Pittsburgh, Pa. All of these but the Weber have been shown in these pages. The Weber is now illustrated for the first time. We also show the Long, because it is a joint which is not yet well known, and the Continuous, because we have never before illustrated it in its latest form. The Fisher and the Cloud joints are now well known to nearly all railroad men who are interested in this matter.

THE WEBER JOINT.

The Weber joint has been in actual service for about two years. The trials of it in track have been on the New York, New Haven & Hartford and the Central of New Jersey, and so far as we can learn they have been very satisfactory. In fact, Roadmasters who have had personal experience with the joint speak of it as, taken all around, the best they have ever tried.

The construction of the joint is clearly apparent from the illustrations. The splice plates and the foot plate are of steel, 10 to 15 carbon. The dimensions are shown. The foot plate is of $\frac{5}{16}$ in. steel, with two slots for spiking, as shown in the plan. The spikes on the outside are turned and driven with the back of the head against the plate. The bolts are ¾ in., with a shoulder under the head to conform to the elliptical bolt holes in the inside splice. The wooden cushion shown extends the length of the joint and is used principally to deaden the noise. No nut locks are used, as the spring of the plate is thought to be sufficient for this purpose. The joint consists, therefore, of four principal pieces and four bolts and nuts.

It is a suspended joint, 24 in. long, covering two ties, and can be made shorter and supported. The depression is $\frac{5}{16}$ in. below the rail base, and to get this room the ties may be adzed, or put so much lower in the ballast. Probably the latter course will be that generally followed.

The joint certainly has points of much merit. Its strength is great. A joint applied to a 76-lb. Central of New Jersey rail tested at the Watertown arsenal up to

200,000 lbs. is shown in the engraving This joint was exhibited at Detroit at the Roadmasters' Convention. The results of the test are given in a table now before us for each 2,000 lbs. load up to 10,000 lbs., and for each 4,000 lbs. up 200,000 lbs. The report is signed by Col. Flagler, commandant of the arsenal, and Mr. J. E. Howard. We condense the table below. The points of support were 8 in. apart; and the load was applied at the middle, over the opening between the rail ends.

Load, lbs.	Deflection, inch.	Set, inch.
50,000	.0315	.0109
70,000	.0522	.0287
90,000	.0610	.0345
110,000	.0789	.0417
130,000	.0786	.0474
150,000	.0818	.0514
170,000	.0872	.0562
200,000	.0956	.0642

The permanent set measured in the length of 24 in. on heads of rails was .08 in.

The joint is easily applied. As all trackmen know, it is important that the joint should not be a hindrance in putting new rails in old track, especially on lines with heavy traffic. It is desirable that a string of rails, with the joints on, may be slipped into place between trains. With some patent joints this cannot be done, as the ties must be specially prepared for the joints. The depression of the Weber joint, being but $\frac{5}{16}$ in. below the base of the rail, has been found to admit of putting in new rails in the same way as with angle splices, without preparing the joint ties in advance. This feature of the Weber joint, that it does not sink deep in the ballast, is a good one in another way. It is now the best, and fast becoming the prevalent, practice to bring up the ballast to the level of the top of the ties and carry it out on this level to or beyond the ends of the ties. If the joint is below this level a pocket is formed in the ballast in which ice will collect, and then the joint is liable to be pounded to pieces in detail. At least this has been the result in instances that we know of. Besides, a joint which extends into the ballast interferes with free drainage, even if it is not itself destroyed.

It will be noticed, as a further advantage of the Weber joint, that by retaining the angle splice principle the alignment of the rails at the joint can be preserved, and in this the shoe also aids.

THE CONTINUOUS RAIL JOINT.

This joint has been before the public for three years, and has been extensively tried and, as we understand, with excellent results. It will be seen that it consists essentially of a clamp applied to the ordinary angle splice. The clamp has a wedge action, and is held by a powerful bolt $1\frac{1}{8}$ in. in diameter. The action of the clamp is to hold the rail ends always to the same level, thus making practically a continuous rail. The joint itself has no bearing on the ties, the angle splices not being carried down as is usual. This is clearly shown in the section and the elevation. Consequently the action of the rails is, it is claimed, exactly the same at the joints as in any other part of their length. The joint is shown here with a nut lock covering two bolts, and with the Verona washer on the main bolt. On the latter a jam nut is now recommended by the makers.

It is claimed as an advantage for placing the angle splices in the staggered position shown that the joint is taken by the wheels without shock, a result which others have aimed to get by making the splices thinner at the ends than at the middle. It will be noticed as a disadvantage of the joint that it requires a special wrench for the large nut; otherwise its simplicity and its applicability to the ordinary splices commend it. The makers recommend that the clamp should not be put on until after a few days' use of the angle splices without it. On the whole, this is a joint from which one would expect very good results. We are informed that it has, in fact, given such results; that there is no jump at the joints and no battered rail ends, but that after many months of service under heavy traffic the rails are found to be worn equally throughout their entire length.

At the Detroit convention a pair of rail ends was shown that had been in service on the Manhattan Elevated four years, and the ends were worn down $\frac{1}{8}$ in. One of the Continuous joints was put on and the rails were restored to perfect surface at the joint in one year. This particular joint was subjected to the passage of 3,679,200 wheels in the year.

THE LONG TRUSS JOINT.

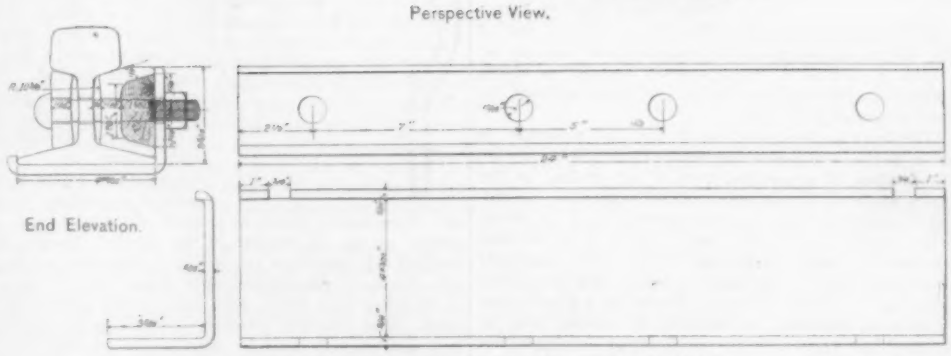
The construction of this joint is clearly shown in the cuts. It is the development of the idea of supporting the rail ends from beneath the flange by a structure more elastic than a simple mass of metal. It has two short angle splices, designed merely to hold the rails in line and to keep the flange in close contact with the base plate. They do not touch the head of the rail. The base plate is 28 in. long, $7\frac{1}{4}$ in. wide, and $\frac{5}{8}$ in. thick under the rail. It is trussed as shown.

This joint has been two or three years before the railroad public, but for various reasons, principally because of the death of its inventor, it has not been vigorously pushed. However, 9,089 joints of this pattern were put in track between April 1 and the end of June, 1889. These were put in on the Chicago & Northwestern, the Baltimore & Ohio, the Chicago, Burlington & Quincy, the Flint & Père Marquette, the Rock Island, the Chicago, St. Paul, Minneapolis & Omaha, and the Pennsylvania lines. The Northwestern has found the joint so promising that it wants more as soon as they can be furnished. Mr. I. Burnett, Rail Inspector for the Illinois Steel Co., with General Roadmaster Brown, of the Flint & Père Marquette, inspected 757 joints on that road, and found but two loose bolts and no low joints. No nut locks were used. These joints were put in in June, 1889, and Mr. Burnett's statement was made Sept. 17, 1890.

It is now proposed to push this joint actively, and it will not be long before more data will be available on which to base an intelligent opinion of its merits.

Of the Cloud joint we shall have something to say in

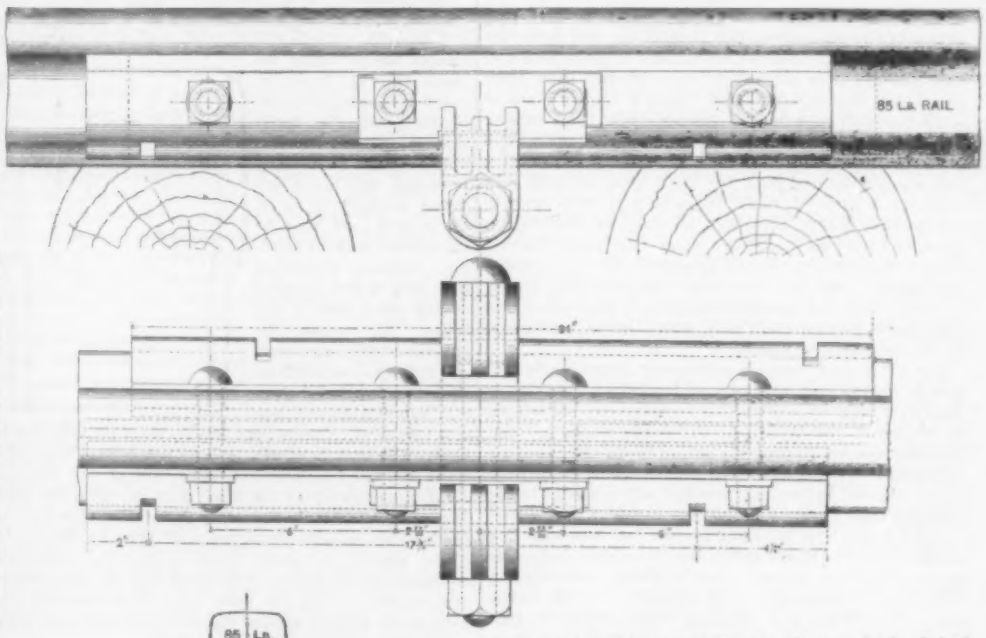
Perspective View.

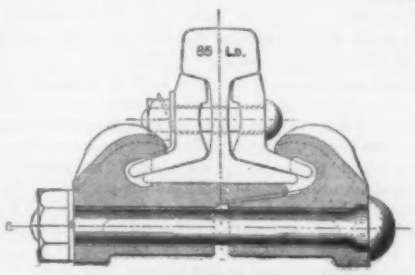


End Elevation.

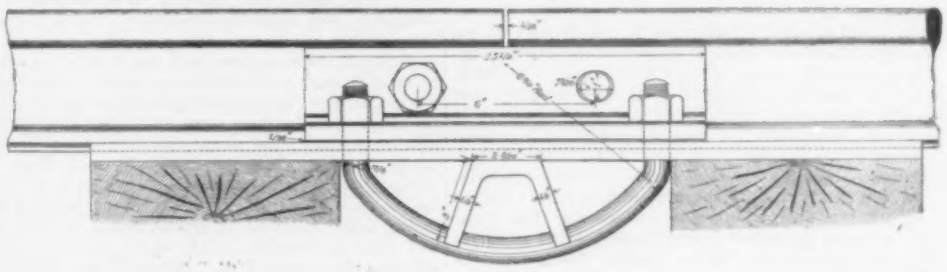
Side Elevation of Channel Splice and Plan and End of Shoe.

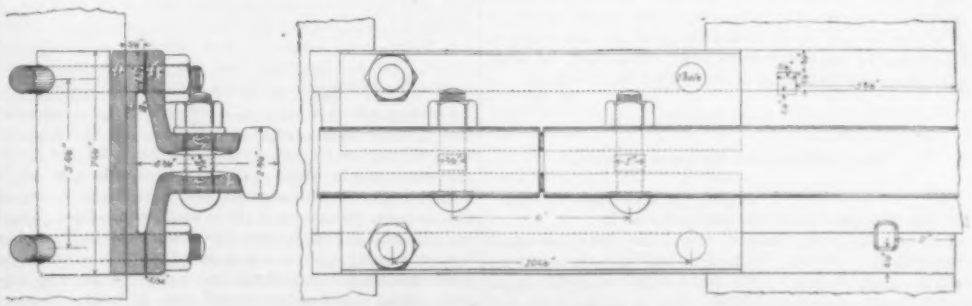
THE WEBER RAIL JOINT.





THE CONTINUOUS RAIL JOINT.





THE LONG TRUSS RAIL JOINT.

a future issue, as we expect soon to get reports of its service in track. The Fisher joint is too well known to need description. It has been used for years, and those who wish to know what results it has given can easily get full information. On the Fitchburg and the Manhattan Elevated, especially, it has had extensive and severe trial and is still used.

Contributions.

Merit vs. Seniority.

TO THE EDITOR OF THE RAILROAD GAZETTE:

NEW YORK, Sept. 11, 1890.

In the recent strike on the New York Central one of the charges made against the company was that no attention is paid to the "civil service system" in filling vacancies, and that promotions are made without regard to seniority of service.

Whether this charge be true or not, the principle, it seems to me, is one deserving more than passing notice. The custom of promoting men of all grades, in the ranks, and even in important official capacities, according to seniority of service, has become such an established practice on most roads that it is a question whether too much importance is not laid, especially among the employés themselves, upon time of service alone, at the expense of special fitness for a given place. Promotion, according to seniority of service, may be the most just system for the majority of employés, but is the system always the best for the company itself? I doubt it. It would be, if all employés were of the same relative degree of intelligence at the outset, and all put forth the same degree of effort to make themselves intelligent and efficient employés; but from the very nature of circumstances this cannot be, and some are bound to make themselves much more capable, and correspondingly more valuable to the company, than their associates; that is, capable of doing a higher class of work, and this in a much shorter time than others. Shall the fact that these men are younger in the service of the company be a millstone around their necks to hold them down and back for their turn, according to seniority of service? Shall the men who work all day and possibly half of the night, to make themselves experts, be bound up under the same rule that controls those who choose to do the opposite? It seems somewhat against our American idea of advancement on individual merit and smacks something of the trade union principle of putting every man, good, bad or indifferent, on the same general footing.

It is a fact that there are constantly large numbers of men in the railroad service who, having a knowledge of their own capacity, are seeking employment elsewhere, by reason of the failure of the roads, under a strict seniority system, to properly utilize them. Heads of departments have to meet this question very frequently. These officers know, and perhaps acknowledge to the employé, that they recognize his capacity and would regret to see him leave the service, but how can they retain him? The man's salary cannot be increased in his present capacity, because that is already established, and is as unchangeable, in an upward direction, as the laws of the Medes and Persians. Neither can the man be promoted to some other position paying a few more dollars per month, because there are other employés who would claim the position by reason of seniority of service. The man leaves, and his place has to be filled by some one less competent, because less experienced. Is this business, and can a railroad afford to lose good men in this way? Would any successful business house be willing to adhere to this rule, or can a railroad be justly censured for recognizing individual merit, regardless of time of service, provided that in so doing an exceptionally good man is retained in its service?

It may be argued that the absence of a strict seniority system at once opens the door to favoritism, without due regard to capacity; but this in not necessarily so, and the officer who makes a practice of recognizing anything but ability alone always finds, sooner or later, that he has loaded himself down with a burden that results in his own downfall; and the great majority of railroad officers have too keen a sense of their responsibility to the company, and toward the employés themselves, to commit any serious injustice in this direction.

Would it not kindle a sharper spirit of rivalry among the men if it were thoroughly understood that their advancement depended entirely on individual merit, as against time of service alone, unless this service be coupled with corresponding ability? Without advocating either system, I simply bring these questions up, as to which is the most desirable practice, and which is likely to give the best results, viz.: Promotion by time of service, or recognition of individual merit alone?

W. W. S.

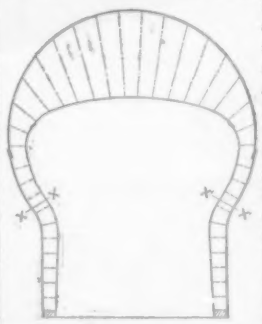
Radial Stay and Belpaire Boilers.

ROANOKE, Va., Sept. 10, 1890.

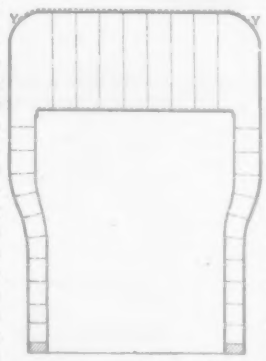
TO THE EDITOR OF THE RAILROAD GAZETTE:

It was with much interest that I saw the question of "Radial Stay" versus "Belpaire" fire boxes brought up in your journal Aug. 1, 1890, and I expected every issue to see some one come forward with an analysis of the strains from expansion and contraction in the two types of boxes. But with the exception of a curt mention of strains generally, this side of the subject seems to have been dropped entirely. It may be all wrong, but the following is the way I look at it, and several locomotive men have agreed with me about it, so I submit the matter to you for publication if you think it worth while.

Take the cross section of a radial stay box as in the sketch: The inner and outer boxes are riveted fast at the mud ring. From x x to x' x' the arrangement of stays converts the inner and outer sheets in a rigid arch, perfectly immovable. Now consider for a minute the state of affairs when the boiler is full of cool or cold water and a fire is built in the fire box. The outer sheet stays cold for some time after the fire in the box has brought the inner sheet to a high temperature; where is the vertical expansion to go to? It cannot go down, on account of the mud ring. It cannot go up, on account of the "arch." Result; the vertical side sheets are put under an immense compressive strain. Consequences; side sheets buckle or pocket in between stay bolts, often erroneously attributed to mud. It is true the presence of a coating of scale will help matters very much by enabling the fire box sheet to take a higher temperature and become softer. Of course the expansion of the fire box longitudinally is not considered here, as it is the same in both cases.



Now consider the section of a Belpaire fire box in the same light. Get the inside fire box as hot as you please, and keep the outside sheets cold, and still no serious strains are produced, because when the inner fire box wants to expand vertically it can do so, as by the dotted lines. The flat upper sheet is usually provided with large round corners at y y. These will give way to the upward push by bending, without producing any destructive strains on any other part of the boiler. Of course, the amount of this expansion and rise is not as much as shown on the sketch, but it is appreciable and *has been measured* by more than one person with this idea in view. The back head of all locomotive boilers is usually made flat, and I believe this takes care of the longitudinal expansion above the mud ring in the same way. Of course, it is hardly necessary to mention that the fire and heat are usually above the mud ring by the depth of the grates and grate bears, so that the expansion strains are not as heavy at the mud ring as they otherwise would be. At the same time, how common are leaks at the corners around the mud ring, and may they not be due to this cause, more or less?



Experience is a good teacher, and in support of the above the following may be of interest. A well-known Southern road, that has made no inconsiderable progress in the last decade, bought early in 1882 fourteen 19 in. × 24 in. ten-wheel engines, which have been in constant service ever since, and in the hardest kind of service. They had "Belpaire" fire boxes. Not one of them has had a new fire box yet, nor are any of them in immediate need of this. In 1883 the same road bought ten 20 in. × 24 in. consolidation engines, and in 1884 bought nine more of this class, with radial stay boilers, same materials used, designs by best makers in the United States, engines in same service, using same water, handled by same men. Eighteen of these engines have had new boxes, and the nineteenth engine is working on a ballast train, with her fire box all over patches and leaks, awaiting her turn for the shop. Some of these eighteen engines are already beginning to show signs of needing renewals of fire boxes again at no very distant date. Two of them were burned, one by carelessness and one in a wreck, but the balance all failed by pocketing or bulging in between stays, followed by cracks, leaks, patches, plugs and final destruction. This same road has put in service a large number of "Belpaire" fire boxes since 1884, and while a number of them have been burned in wrecks by carelessness and from mud, not one of them has failed from buckling and cracking as mentioned above. Nor has the road had the same trouble with wagon top boilers using crown bars and sling stays.

Further, a broken stay on a Belpaire is a comparative rarity, while on the radial stay boilers the three upper rows of stays on the sides (under the heels of the arch) are constantly breaking. On several occasions 10 or 12 stays have broken all at once, like a rattling volley of pistol shots, where one of these engines has been "laying out" and the engineman has attempted to "get her hot" in a hurry with a big wood fire. If the above is good reasoning, I cannot see one valid reason why another radial stay fire box should ever be built.

R. P. C. S.

Buildings and Structures of American Railroads.*

No. 4.—DWELLING HOUSES FOR EMPLOYES.

BY WALTER G. BERG.

Special dwelling houses have frequently to be built by railroad companies for the use of their employés, wherever their roads pass through sparsely settled districts, or where, for other reasons, it is desirable to have the men live at certain localities selected by the railroad company. Apartments for the accommodation of agents

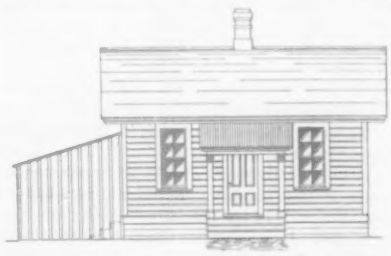


Fig. 1.

are frequently furnished in the depot buildings, and trackmen are given "section houses" to live in; but there are numerous other employés to be provided for, especially at points where shops or junction stations are located at some distance from settlements.

While the principles governing the design of a dwelling for railroad men do not differ from those for other

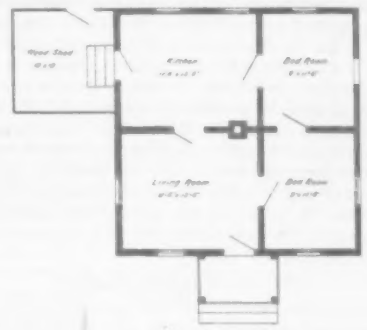


Fig. 2.

persons under similar conditions, it will prove interesting to present a few standard designs for dwelling houses as actually adopted and in use on several railroads at the present time. There is considerable material to select from, but, as the subject is not distinctly a railroad specialty, it does not warrant devoting too much space to it.

A cottage in use on the Northern Pacific system (designed by Mr. C. B. Talbot) illustrates the practice on Northwestern roads. Designs for cottages of the Chesapeake & Ohio (designed by Mr. H. Jacob, engineer and architect, Richmond, Va.), and plans of a dwelling or section house on the Atchison, Topeka & Santa Fe Railroad, will serve to present the practice on Southern systems.

The following descriptions of a number of buildings are presented as illustrative of the subject under discussion.

Agent's Dwelling, Northern Pacific Railroad System.—The standard plan for an agent's dwelling of the Spokane

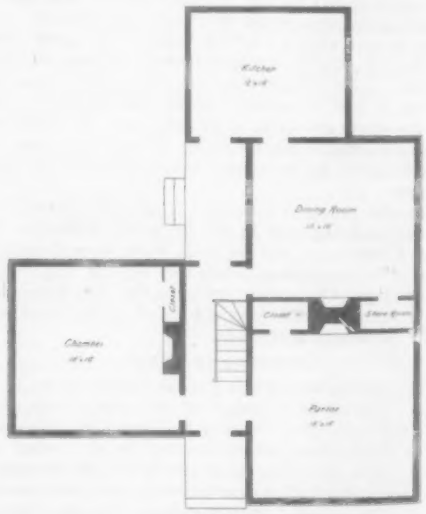


Fig. 3.

& Palouse Railway, connected with the Northern Pacific Railroad system, shown in figs. 1 and 2, is designed to meet the conditions to be encountered in a Northern climate. It is a one-story, frame building, 24 ft. × 24 ft., with a small front porch and a wood-shed annex. There are four rooms in the house, as follows: A sitting room, 11 ft. 6 in. × 13 ft. 6 in.; a kitchen, 11 ft. × 13 ft. 6 in.; and two bedrooms, each 9 ft. × 11 ft. 6 in. The wood-shed adjoins the kitchen, so that in winter fuel and other supplies are close at hand.

The foundations are either posts set in the ground in

*Copyright 1890, by Walter G. Berg, and condensed from a forthcoming book on the subject.

three rows, each row with five posts, or blocking, according to the local circumstances in each case. The sills are 6 in. × 8 in.; floor joists, 3 in. × 8 in., spaced 2 ft. centres and spanning 12 ft. The frame is of the usual style and dimensions, covered on the outside with V rustic sheathing and roofed with cedar shingles on boards or otherwise, according to circumstances. The shed annex is sheathed with rough boards and battens.

Five-Room Cottage "L," Chesapeake & Ohio Railway.—Fig. 3 is a plan of a five-room cottage of the Chesapeake & Ohio. It is a frame building, L-shaped, the main sec-

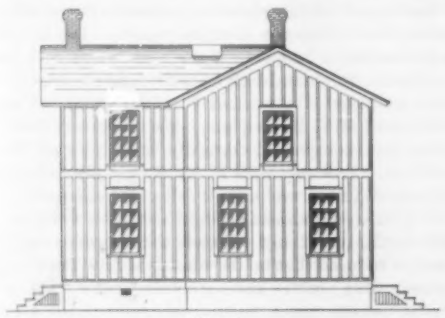


Fig. 4.

tion, 23 ft. × 35 ft. 6 in., with an annex for a kitchen, 16 ft. × 12 ft. 6 in., and an annex for a chamber, 17 ft. × 17 ft.

The ground floor has two verandas or porch entrances; a parlor, 16 ft. × 16 ft.; a dining room, 15 ft. × 16 ft.; a chamber, 16 ft. × 16 ft.; and a kitchen, 12 ft. × 15 ft. The second floor has one room, 16 ft. × 16 ft.

A seven-room cottage of the Chesapeake & Ohio is a two-story frame building throughout, excepting a small single-story kitchen annex.

The ground floor has a front veranda and a back porch; a parlor, 13 ft. × 16 ft.; a dining room, 15 ft. × 18 ft. 6 in.; a chamber, 15 ft. × 18 ft.; and a kitchen, 12 ft. × 12 ft. The second floor has three rooms, respectively 15 ft. × 18 ft., 13 ft. × 16 ft. and 11 ft. 6 in. × 18 ft. 6 in.

Dwelling House, Atchison, Topeka & Santa Fe Railroad.—The Atchison, Topeka & Santa Fe Railroad has three classes of standard dwelling houses, known respectively as section houses No. 1, 2 and 3. In figs. 4 and 5 the side elevation and ground plan of the standard plan No. 2 are shown. The other standards do not differ materi-

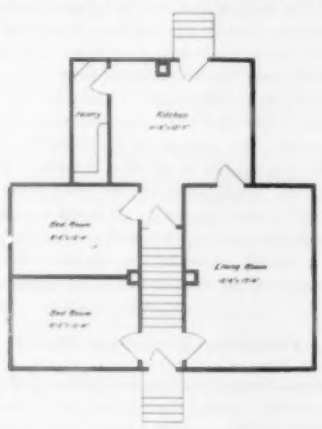


Fig. 5.

ally from the one illustrated, except in size and minor details. In general the designs show a two-story plain, frame building, sheathed on the outside with upright boards and battens, and the whole built very cheaply and without any attempt at display.

Standard No. 2 shows a building occupying a ground space of 30 × 30 ft. There is a cellar under the house. The ground floor has a living room, 12 ft. × 17 ft.; two bedrooms, each 8 ft. × 12 ft.; a kitchen, 12 ft. × 14 ft., and a large pantry. The second floor has three bedrooms, each about 12 ft. × 17 ft.

Camber of Bridges.

BY THEODORE COOPER.

The sagging of the nominally horizontal line of a bridge below the real horizontal line not only is displeasing to the eye of the observer from the æsthetic point of view, but also from the impression given of a want of strength. Although the deflection of a bridge is no measure of its strength, and it is unimportant as far as the real strength is concerned whether the structure deflects below the horizontal line or only down to the horizontal line from some cambered position, the impression left upon the mind of the observer is an entirely different one for the two cases. There is, of course, an increase or decrease in the downward effect of a rapidly moving load traveling over a track with a downward or upward curve due, to the centrifugal action. It is, however, slight in amount.

The bridge designer or constructor seeks to give the trusses a camber sufficient to prevent the line of reference sinking below a straight line when subnitted to its maximum duty. For this purpose it is necessary to construct the bridge so that the chords will have a curve exceeding somewhat the curve due to the deflection and in the reverse direction. Some engineers specify that "the camber must not be less than a certain fraction of the span" ($\frac{1}{1200}$). This, however, makes no provision for the varying depths of different bridges of the same span. The deflection of bridges built to the same rolling loads and unit strains will vary nearly as the square of the span and inversely as the depth $\left(\frac{l^2}{d}\right)$, so that the above rule is only applicable to trusses of varying spans which have the same ratio of depths.

The only perfect method of giving a camber which would exactly correspond at all points, reversely, to the curve of deflection would be as follows: Increase the length of each compression member and decrease the length of each tension member during construction by an amount equal to the elastic deformation when subjected to the full load. This method, however nice theoretically, is practically objectionable for ordinary skeleton trusses. It makes too many and too minute changes, when distributed thus over all the members, for good and accurate shop practice.

Equally good practical results can be obtained by assuming that the length of the pieces in one chord and all the posts remains unchanged and only make the changes in the remaining chord and diagonals. For ordinary spans under the usual specifications for iron railroad bridges, an increase in the length of the segments of the top chord of ⅛ in. for each 10 ft. in length, and a change in the lengths of the diagonals to correspond to the new triangles, is a good practical rule, easy of application, and correct for any proportion of depth to length of truss. Where steel or iron, with higher strains than usual is employed, the above rule must be modified accordingly.

A proper camber having been provided during the construction, let us consider the bridge when erected in place. It has now taken the deflection due to its own weight and permanent load, reducing the original camber by this amount. When the ties (of uniform thickness) and rails are in place the track will have a camber equal to that of the completed bridge. To the eye of the road or track master this will look "out of surface." Some few will be satisfied to let the track alone. The majority, however, will proceed to remove part or all of this camber by notching down the ties. The general result is, then, an unsatisfactory track; for a perfect and accurate notching of the ties to reduce a curved line to a flat one, without the use of shims, is not easily obtained. The principal purpose of giving the camber to the bridge has been destroyed. If the trackmaster must have a level track over his bridges, it would be better to omit camber from the iron work and use full and uniform ties over the bridge. Likewise, if he will only allow a certain amount of camber to his bridge tracks, the bridge should be built to this camber, with a proper allowance for the dead load deflection.

The camber of the track over a single span bridge, when not excessive, is not objectionable to the educated eye. A series of cambers or humps in the track where there are a number of spans in succession is not pleasing. These could be avoided in many cases by raising the piers towards the centre, so that the whole structure would have a general camber fitting to the cambers of the individual spans. Of course, in such cases, the general camber should be based upon the camber of the several spans after erection, and not upon the constructive camber given at the shop. The middle ordinate of this general camber would equal the middle ordinate of the camber of one span multiplied by the square of the number of spans (if equal) in the whole structure. Such a general camber would improve the appearance of a long bridge and would not involve any great difficulties or expense. In some places the question of grades and local features might render this method undesirable; but some method avoiding the notching of ties should be adopted.

Test of Armor Plates.

An official test of foreign armor plates was held at Annapolis, Md., on Thursday, Sept. 18. There were three plates tested—two manufactured by Schneider & Co., of Creusot, France, and one by Cammell & Co., of Sheffield, England.

The Cammell plate was of composite steel and iron, an iron backing with a steel face, similar to a majority of the plates used on the English armored vessels. The Schneider plates were of two kinds—one all steel and one of steel with 4 per cent. of nickel. The plates were made 8 ft. × 6 ft. and 10½ in. thick. The gun used was a high-powered 6-in. rifle of 35 calibre. The projectiles used were of French make, by Holtzer & Co., of forged steel body and chrome steel points, weighing 100 lbs. each, and 17 in. in length. The firing charge was 44¼ lbs. of American powder, giving an initial velocity of 2,075 ft. per second. All three plates were mounted as targets in a circular arc, each at a distance of 28 ft. from the muzzle of the gun.

Four shots were fired at the plates—one near each corner, the centre of each plate being reserved for a final shot either with the 6-in. gun or with an 8-in. gun to replace it.

The four shots fired at the Cammell plates were disastrous. The first shot fired at this plate was aimed at the lower right-hand corner. It went clean through the 10½ in. of metal and into the backing supporting the plate, leaving a space of 11 in. between the rear of the plate and projectile, cracking and crushing the plate badly. The second shot, fired at the lower left-hand corner, had a similar effect. The plate was cracked clean across the bottom as a result of the first and second shots, and most of the steel facing was broken away. The third shot was fired at the upper right-hand corner, and went clean through the plate, lodging, like the other two, in the backing, this one leaving a space of 13¼ in. between the rear of plate and rear of shell, the plate metal being badly cracked and broken. The fourth shot almost finished the plate. The projectile penetrated the upper left-hand corner, going through both plate and backing, a large piece breaking off and imbedding itself in the ground some 35 yards back of the target. As a result of the two upper shots, that portion of the plate was entirely broken up and the steel face gone. Broken pieces were everywhere, the majority lying between the target and gun, in all sizes and shapes. The plate, as a whole, was now so badly broken up that it was deemed inadvisable to fire the fifth shot for fear of injuring the gun by the flying pieces.

The four shots fired at the all-steel Schneider plates produced quite a different result, the damage being local with each hole made and with no effect on the rest of the plate. The first shot was solidly imbedded in the lower right-hand corner of the plate, with 3 in. of the rear end sticking out from the face towards the gun. The second shot penetrated just through the lower left-hand corner, and rebounding, was found lying uninjured just beneath the muzzle of the gun. Its length was shortened one-twentieth of an inch. The third shot, fired at the upper right-hand corner, penetrated the plate and rebounded like the second, being shortened by compression some three-twentieths of an inch. The fourth shot, fired at the upper left-hand corner, had a similar effect on the plate to that of the other three, but it broke, the rear portion only rebounding.

The first shot fired at the Schneider nickel-steel plate struck the lower right-hand corner, making a hole clean through the plate, the point sticking through, and the back end, being broken off, rebounded some 25 ft. toward the gun. The second shot, fired at the lower left-hand corner, penetrated and lodged in the plate, the rear of projectile sticking out from the plate toward the gun some 2¼ in. The third shot, fired at the upper right-hand corner, resulted about the same as the second, except that there was a back projection of 3½ in. instead of the 2¼ in. of the previous shot. The fourth shot, fired at the upper left-hand corner of the plate, resulted similar to the first shot, the projectile breaking up, leaving the point sticking through the back of the plate, while the rear portion rebounded from the hole.

In continuation of these tests, the three plates were each subjected on Monday, Sept. 22, to a central shot from an 8-inch rifle set with the muzzle 30 ft. from the face of targets. A Firming process armor-piercing projectile weighing 210 lbs. was fired with a charge of 85 lbs. of powder, giving an initial velocity of 1,850 ft. per second.

The shot fired at the Schneider all-steel plate penetrated 4½ in. into the backing and rebounded from the hole, breaking into three long and equal pieces. The hole was clean, but four cracks extended radially from it to and through each of the 6-in. holes in the corners of the plate. An examination of the plate after being taken down will show the extent, depth and injurious effects of the cracks. Apparently, as the plate held firmly together, the cracks did not go through the full thickness of the plates.

The shot fired at the nickel-steel plate penetrated 6½ in. deeper than did the shot at the all-steel plate. But no cracks were to be seen on the surface. A hole was made with no apparent injury to the plate beyond 2 or 3 in. about its circumference. The projectile was very badly broken up, the chrome-steel point remaining bedded in the backing.

As a consequence of this breaking up of the 8-in. shells, it was decided to try a third shell at the unfortunate Cammell plate. The gun was carefully protected, and the shot fired, with the result that the entire steel face was broken away in small pieces except a few projections along the longer vertical sides of the plate. Only a badly cracked and easily penetrated wrought-iron plate remained as a defense against further shots. The projectile had passed clean through both plate and backing and was found firmly bedded in the earth backing 15 ft. away, pointing upwards.

This finished the trial, with the result of throwing out the Cammell plate and raising a further contest between the all-steel and nickel-steel plates.

The test was necessarily a severe one to display the capabilities of each plate in the most positive and emphatic form. Numerous European trials had already been made with the same style of plates, but with less decisive results than these tests. Hence the advocates of both the all steel and nickel-steel systems and the composite steel and wrought-iron system have had encouragement, and both kinds of armor still continue to be used and to be adopted for new vessels. The results of the Annapolis experiments, however, are of so emphatic a character as to change all this and force the composite plates to the rear, unless it is shown conclusively that the Cammell plate was defective. There is, of course, a possibility of this being the case, but it is hardly probable, since the plates were all furnished as samples for test purposes.

Want Autocratic Air Brakes.

Under this heading an exchange prints the statement that the members of the Order of Railway Trainmen have about completed their canvass for signatures urging Congress to pass a law requiring railroad companies to equip all trains with a uniform system of air brakes.

RAILROAD GAZETTE

Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

CONTENTS.

ILLUSTRATIONS:	PAGE.
St. Clair Tunnel	659–661
Rail Joints	663
Dwelling Houses for Employés	664
CONTRIBUTIONS:	
Merit vs. Seniority	664
Radial Stay and Belpaire Boilers	664
EDITORIALS:	
The Reading Accident	666
Promotion—Seniority or Merit?	666
Radial Stay and Belpaire Boilers	667
Annual Reports	667
Scranton Branch of the N. Y., O. & W.	667
EDITORIAL NOTES	666–668
GENERAL NEWS:	
Locomotive Building	670
Car Building	670
Bridge Building	670
Meetings and Announcements	670
Personal	671
Elections and Appointments	671
Railroad Construction	672
General Railroad News	673
Traffic	674
MISCELLANEOUS:	
Technical	669
The Scrap Heap	670
The Hudson River Tunnel	662
Camber of Bridges	665
Tests of Armor Plates	665
Swing Beam and Rigid Trucks, and Flange Wear of Wheels	668
The Chicago Railroad Problem	669

A difficult and dangerous tunnel has just been made quickly and successfully across the St. Clair River by the method of a shield, and lining up with cast iron as the shield advances. The City & Southwark Subway tunnel in London was driven by the same method, and the Hudson River tunnel is now likely to be carried out successfully in the same way. The success of these great enterprises robs subaqueous tunneling of a good deal of its terror. It is not yet a picnic to drive a shield through gravel and quicksand, through which the air blows out, but it is demonstrated that even that can be done. The result of these recent successes will be to stimulate tunneling under navigable rivers where bridges are too costly or objectionable. We suppose the Detroit tunnel project will now be urged more vigorously, and we should not be surprised if it were begun within a year. A bridge at that place is preferred by some of the parties interested as less objectionable to travelers than a tunnel; but is not likely that the government will allow the channel of an immense commerce to be obstructed; and a bridge of such height and span as not to obstruct the channel would be more costly and approached by steeper grades than a tunnel. A tunnel can now easily be so drained, ventilated and lighted as to be entirely unobjectionable to travelers, but of course it cannot be made a spectacle to attract them as a bridge across the Detroit River would be. But that either a bridge or a tunnel will be constructed there soon we have little doubt, and the chances seem to be that it will be a tunnel.

A correspondent has sent to us the following question concerning a point in train dispatching on which we suppose he desires the criticisms of superintendents, dispatchers and others who have had experience with similar problems.

West. East.

E D C B A

Eastbound trains have right of road.

The trains affected are { 51 westbound and / first and second 44 eastbound.

First order; placed at A and E.

"Train 51 (engine 134) has right of track against first and second 44 (engines 144 and 135) *A* to *D*."

Second order; placed at B and D.

"Train 51 (engine 134) and first section train 44 (engine 144) will meet and pass at *C*. Train 51 will take side track."

Question.

Has first 44 any right to leave *D*, on the last order, after 51 is due at *D*?

It will be seen that the essential question is, whether it was right for the dispatcher to issue the second order without first annulling the first, or else stating to what extent the second one superseded it. We think any fair-minded judge will admit that he should not, and that, therefore, the conductor of First 44 would have been amply justified in refusing to move from *D*. And yet he would have strong justification for the opposite course. The first order reversed the relations between eastbound and westbound trains and had no further effect. This being the case, the conductor of First 44 might with reason have argued that the second order, making a definite meeting point, could be assumed to have superseded, to that extent, the first order; in the same way that an ordinary meet order supersedes the time table. But if the operator had failed to properly deliver the second order to train 51, or this train had made any mistake in acting upon it, and a collision had ensued, strict constructionists would have at once enlarged upon the possibility of preventing the collision, which lay in the power of the conductor of First 44. If, in such a contingency, he were to be more cautious than would ordinarily seem necessary, he would counteract the effects of other people's carelessness. As the second order presumably shows, by its number, that it was issued subsequent to the first order, and as First 44 has a right to assume that the order has been properly delivered to train 51, many superintendents will say that the conductor acting upon it is not to be censured, much less punished. Doubtless our correspondent would like to learn how many careful superintendents agree with this view. The moral of the case, if it be a real case, is, that dispatchers, as well as conductors and operators, need careful training, under a system which shall call them to account for all deviations from the very best practice, whether it results in collisions, or only delays, or nothing but criticisms from trainmen. The general conduct of the dispatcher's office, whether it be run by the superintendent himself or by a dispatcher whom the superintendent rates only a trifle higher than an ordinary operator, should be such as to encourage trainmen to promptly report all difficulties like the above. The great merit claimed for the single order system is the simplification of the conductor's duties in keeping track of and reading his orders; those who use the duplicate system should see to it that their practice is not needlessly weak in this respect.

The Reading Accident.

The Reading accident, the essential facts of which are given in another column, was one of the worst of the many serious accidents which we have had to record in the last few months. On a double-track road a coal train of 150 cars parted. Before it could get under way again a similar train, following, ran into its rear, derailing cars and throwing part of the wreck over to the opposite track in front of an express train approaching at 50 to 55 miles an hour.

The first train had slowed before the break-in-two, and the coroner's jury blames the flagman for not getting back when he saw that his train was losing time. The evidence that we have seen does not show that the speed had been so far reduced as to require him to do this under the rules. It does show, however, quite conclusively that he had ample time after his train stopped to get back far enough to stop the following train. Knowing, as he must have known, how close together trains are run on his road, there is no excuse for his slowness. So far as he is concerned the verdict appears to be just, although it may not be technically accurate.

We think, however, that the conductor, who was in the caboose with the flagman, should come in for a share of the blame. Apparently he was not so strict and alert in protecting his train as he should have been. He must have known that the flagman was slow in starting back, even if he did not think the speed of the train was reduced so far as to require him to get back with torpedoes before it actually stopped.

But beyond all this there is a responsibility which the coroner's jury has not touched upon. The accident would not have happened if the coal trains had been run under absolute block signals; and it might not have happened if they had been equipped with air brakes and M. C. B. couplers. We do not say that the latter provisions would certainly have prevented the accident. Probably with M. C. B. couplers the first train would not have parted; with air brakes the second train would almost certainly have been stopped in 400 yards, or if not stopped the speed would have been so reduced that no derailment would have taken place. But with the absolute block the two trains would have been held apart and all the trouble prevented. The cost of this one accident will undoubtedly be enough to have equipped the entire main line division of the Philadelphia & Reading with a first-class block signal system, with blocks so short that they would actually have quickened the movement of its numerous coal trains. A traffic that requires the movement of trains of 150 cars at 12-minute intervals, to say nothing of 13 regular passenger trains a day each way and of a great volume of merchandise freight, certainly requires the protection of block signals, and no company doing such a business is justified in delaying the introduction of a precaution so ancient and so perfectly obvious.

We do not pretend to criticise the management for running trains of 150 coal cars. How many of these cars were four-wheelers we do not know; but from the length of the trains and the fact that about one-third of the company's coal cars are four-wheelers, it is fair to assume that a good many of them were the short cars. Everybody knows that a long train of four-wheeled cars is about as ugly a thing as can be put on a road, and if the business requires that such trains should be run, the obligation to protect them by all reasonable appliances is all the greater. Admitting, therefore, the negligence of the trainmen, and the fundamental lesson taught by all train accidents, that discipline is the essential condition of safety, there remains as a special lesson of this accident the necessity of good couplers, air brakes and block signals.

Promotion—Seniority or Merit?

A correspondent raises the question whether promotions in railroad service should be by seniority or by merit. We take it that if there were any possible human means of selecting the most meritorious man for each promotion there would be no question of length of service. Promotion by seniority is only a makeshift to secure approximately the fittest man, and so is any system of competitive examination or of unrestricted selection. It may be that, on the whole, considering the difficulty of knowing very much about all the qualifications of each member of a great body of men, the best results will be got by promoting by length of service in the subordinate positions where the work is routine and there is little call for judgment or initiative. In the army this system is carried to the extreme, and, while the results are perhaps better than could be got by any other method, they are by no means ideal, particularly in time of war. There officers are promoted by seniority up to the rank of colonel, and general officers may be appointed from any grade and without regard to length of service. But even in the army, non-commissioned officers are chosen arbitrarily, and it is very questionable if all officers above the rank of captain should not be selected with regard to fitness rather than by seniority.

In the railroad service the best results will probably be got in the subordinate grades by keeping a record of the men's qualifications, such as the Louisville & Nashville uses, and including a record of length of service, and promoting by that. If this record can cover the results of occasional examinations also, so much the better. We should attach a good deal of importance to examination of men periodically or occasionally. It is not only good for the company, but spurs the men (or the better portion of them) to better fit themselves for being examined. Even informal conversations between an officer and his trainmen or stationmen are useful to superintendents who cannot get the necessary appropriation for establishing more formal means of instruction and examination. If a superintend-

ent succeeds in teaching one point to one man man he has strengthened the argument by which he will some time induce the directors to provide him with a tutor to teach all his men, thereby bringing him up to the level of the "Labor" organization, which is wise enough to employ a "lecturer" to spread its theories. These and various other devices all tend to bring the officers and men more familiarly together, and to make them know and respect each other; and, what is equally or more important, they give the men more intelligent and discriminating views of their work and of the company's interests.

But whatever method is adopted for selecting men for promotion, it is important that all should see the justice of the selection. If promotions are wisely made, this will, in the long run, demonstrate itself; but if the man knows the records and services of those who are promoted, and the motives that underly the promotions, matters will be all the easier from the outset. There is nothing more demoralizing to a staff than a suspicion of favoritism, and it is worth a good deal to avoid this. It can be avoided by a consistent system of promotion by seniority; but if that system does not promote the best men, there should at least be some consistent and well understood method of selecting those men, and of selecting them from among the members of the staff of the road, when this is at all possible.

Radial Stay and Belpaire Boilers.

A correspondent shows in another column that radial stay boilers have not been successful in one instance on a 20 × 14-in. consolidation engine, while on a 19 × 24-in. 10-wheeler Belpaire fire boxes gave very satisfactory results. The trouble experienced with the radial stay boilers was in the bulging of the sheets between the stays and the cracking of the stay bolts. This experience is different from many roads that have had radial stay boilers in use. From such evidence as we have seen there seems to be no advantage in favor either of the Belpaire or the radial stay type in the matter of breaking stays or cracking or bulging of the sheets. Both give very satisfactory results, and fewer broken stays are noticed with either of these types of fire boxes than with the crown bar design.

Strong arguments in favor of the radial stay boiler are found in the extreme simplicity, large steam space and minimum weight; also, in the case of the Baldwin Locomotive Works design, in the good location of the dome on the wagon top. In the Belpaire design the dome has to be placed on the waist; the steam is then taken from the wagon top by means of a collector. Probably the greatest advantage is found with the radial stay boiler on roads where the water supply contains a large percentage of scale-producing compounds or mud. In such cases it has no equal in facility of cleaning, the obstructions above the crown sheet being absolutely at a minimum.

The facility of cleaning, steam space, dome location and weight have not been discussed by our correspondent; therefore we shall not consider them here, but refer simply to the bulging and cracking as a result of expansion. A careful examination of the diagrams which he sends will show that there is not that difference in confined expansion between the radial stay and the Belpaire box that is claimed. It is hardly right to say that the stays convert the fire box of the boiler into a rigid arch, because the rigidity of the arch so largely depends upon the stiffness of the stays, and there is no lateral bracing between the stays to prevent the distortion of the quadrilaterals formed by the stays and the sheets. One sheet may expand without the other expanding, provided the stays bend. This takes place in all fire box sides of locomotive boilers. In the case of a crown bar fire box, the expansion is greatest at the top; that is, it is cumulative, both sheets being, in a practical sense, rigidly held at the mud ring, all expansion, therefore, taking place at the top of the sheet.

The crown of the fire box becomes heated, as well as the sides, and expands laterally. In fact, the crown expands more per foot than the sides of the box, because it is hotter. In considering this question, then, the fire box should be considered as a whole. Let us, therefore, suppose that the whole interior of the sides and the crown in both the Belpaire and the radial stay boilers expands. In the case of the Belpaire box, the cross stays are placed directly above the crown sheet, and when a rapid fire is built with cool water in the boiler—the conditions assumed by our correspondent—the expansion of the flat crown sheet laterally gives rise to the same tendencies which he says exist in the case of the side sheets of the radial stay boiler. Here lateral expansion is prevented by the cross stays and the screw stays in the same manner in which he claims that the expansion of a side sheet is prevented in the case of the radial stay design. Why, then, should we not expect as much buckling in the crown sheet of the Belpaire design as in the side sheets of the radial stay type; and more particularly so, because the crown sheet of the Belpaire is absolutely flat, whereas the side sheets in the radial stay type have a decided bend at two points, both of which assist materially in preventing severe compression strains in the well-known way of a corrugation in any sheet. The Chicago, Milwaukee & St. Paul road, for years, put vertical corrugations in their fire boxes to prevent buckling due to expansion longitudinally. In some such way, no doubt, the crooked forms of the radial stay side sheet assist in reducing the compression strains.

But this is a delicate point to discuss, and a few practical results are worth volumes of argument; therefore, if those interested in this matter will send to us such evidence as they have we shall place it before our readers.

Annual Reports.

Wabash.—The report of the Wabash Railroad Co. for the year ending June 30 covers the first year under the reorganization and consolidation. Under such circumstances the statistics are very favorable, the road having earned all of its fixed charges and a surplus which in time will enable a larger part of the contingent interest to be paid also. For the present the managers will do wisely to apply such surplus toward taking out the sags in the roadbed in Missouri which President Ashley speaks of. The equipment account is restated according to actual number of cars and engines in service, giving a fair starting point. Empty freight car mileage is but 27 per cent. of the whole—a very good showing. The train loads averaged 196 tons as compared with 179 tons last year; the average haul also increased from 175 to 200 miles. Rates per ton were, however, .647 cent in 1890 and .756 cent in 1889, causing a fall in the earnings per freight train mile from $1.36 to $1.27, the latter amount being, under the circumstances, quite fair. The tons one mile rose from 1,094 millions to 1,430 millions, the gross freight earnings increasing nearly a million dollars.

The number of local passengers increased, but not the through, the movement for the year being 3 millions of passenger miles less than the year before. There were carried 33 passengers to each average train, earnings being 88 cents per train mile; fare, 2.13 cents average. An interesting point is the average daily freight car mileage: Wabash cars made 34.2 miles on their home road, and 26.3 miles on foreign roads, while foreign cars on the Wabash made 51.9 miles per day. Of the commodities carried, corn constituted 17.6 per cent., coal 23.5 per cent., wheat 5.8 per cent., and live stock the same as wheat.

The income account is condensed thus:

Gross earnings		$13,352,872
Operating expenses		9,673,221
Net earnings		3,679,651
Other income		272,435
		$3,952,086
Interest on bonds	$2,529,091	
Rentals	578,713	
Taxes	396,490	
Contingent interest	210,000	
		$3,714,294
		$237,792

President Ashley devotes a number of pages to a review of the rate situation. He cites Iowa legislation and its results, though but a small part of the Wabash lines is in that state. The states east of the Mississippi, where the greater part of the Wabash lies, have not been as yet directly hostile. The charge brought by the report against Congress for prohibiting pooling, and the assertion that such prohibition is indirectly responsible for much of our railroad losses, is unquestionably true. The Wabash lines are so situated as to compel their traffic, both local and through, to conform to Trunk line rates; hence the success of the Wabash must depend—now that fixed charges are adjusted—to a great extent upon a large tonnage economically handled in heavy train loads at a low price per ton. The growth of the coal traffic from this point of view is very favorable and should be pressed. The President asks for $500,000, to be spent at once upon the lines west of the Mississippi. Everything that can be spared above fixed (not contingent) interest should be spent upon the property until the greatest economy of operation shall have been secured. The report shows that the managers fully appreciate the situation, having made a good beginning for the new corporation.

Chicago, St. Paul & Kansas City.—In accordance with the recommendation made by President Stickney, General Manager J. M. Egan was elected President and General Manager of the Kansas City road, Mr. Stickney declining a re-election. The suggestion also made by Mr. Stickney, that a chairman of the board having charge of the finances should be elected, remains to be acted upon.

The statistical portion of the report shows remarkable changes as compared with the previous year. Tons handled increased 59 per cent., gross earnings 63 per cent. and net earnings 45 per cent. The figures for the years ending June 30, are:

	1889.	1890.
Gross earnings	$2,777,986	$4,225,665
Operating expenses	2,055,266	3,178,885
Net earnings	$722,720	$1,046,780
Rentals, taxes and fixed charges paid.		337,825
To credit of income		$708,955

The priority loan, the only one on which interest was paid, amounts to $941,050, the accruing charges for 1890-91 being about $40,000, more than the present year Coupons for two years on $18,800,000 first mortgage are to be funded into the priority loan; the general mortgage for $4,820,000 does not draw interest also till 1892. The company has till then to establish itself. Consequently it ought to occasion no surprise to find that the road's increase in traffic has been carried at low rates. Grain constituted nearly one-third of its business, of which wheat and flour from Minneapolis were but a small part. The average rate per ton mile was, in 1889, .95 cent, corresponding closely to other granger roads, but the present year it averaged but .72 cent. The rates for each month of the year are given. These fell from .94 cent in July, 1889, to .58 cent in June, 1890. Considering that this is an average, it is clear that some very cheap freight—presumably grain—was handled.

The average haul increased from 211 miles in 1889 to 285 miles in 1890, showing that the increase in gross earnings came from long-haul competitive freight. The train load in 1889 was 120 tons, and in 1890 136 tons. In spite of this increase the earnings per freight train mile dropped from $1.14 in 1889 to 98 cents in the year under review.

Maintenance of way and structures averaged $440 per mile; motive power, 19 cents per engine mile. The passenger rate was held up to 2.02 cents per mile, but against this must be charged a large increase in items of operating expenses, such as commissions (increase $17,468), advertising (increase $49,889), and outside agencies (increase $60,369). The number of passengers increased 5 per cent., the passenger miles 52 per cent., and the gross passenger earnings increased $241,997, almost exclusively, it will be seen, from through competitive traffic.

The divisions of the operating expenses are:

Maintenance of way	$371,566
" of equipment	375,381
Conducting transportation	1,865,128
General expenses, including general office expenses	566,810
	$3,178,885

It is unusual to find the general office expenses larger than the amounts for maintenance of way and of equipment. The proportions charged above will excite comment. The President makes the following important statement: "It is the settled policy of the management to occupy a conservative position in regard to rates, always favoring fair and stable rates, never making a cut of its own accord, but always meeting the rates made by other companies." The average mileage operated was 845 miles.

The Scranton Branch of the New York, Ontario & Western.

In writing last July on the new railroad construction for the first half of 1890 we said: "The most important competitive lines building in old territory are perhaps the new line of the Seaboard & Roanoke to Atlanta and of the New York, Ontario & Western to the anthracite coal fields."

The latter line, 54.37 miles, from Hancock, on the line of the Ontario & Western, to Scranton, Pa., was opened for traffic last July, and at once began business as a coal carrier. The shipments of coal over this branch were 25,000 tons in July, and will rise to 35,000 tons in September. The new line was opened with a guarantee from producers of about 750,000 tons of coal the first year and 950,000 tons thereafter, with every probability that this will increase rapidly for some years. To provide for this traffic a large amount of new equipment has been ordered and most of it is now delivered, consisting of first rate 8-wheeled coal cars and consolidation engines. A considerable addition will, however, have to be made to this equipment to handle the coal which will be offered before the end of the year.

The Hancock-Scranton line is destined to revolutionize the position of the New York, Ontario & Western. It is confidently expected that it will double the gross earnings of the system within a few years. It is therefore an enterprise of the greatest importance to the security holders of that road. Its importance as a new outlet for Scranton and the Lackawanna-Wyoming valley, and as a competitor for a share of the great traffic of the northern anthracite coal fields, make it an enterprise of a good deal of interest to others than its own security holders. We give a brief description of it from personal observation.

The Hancock-Scranton line is 54.37 miles long from Scranton to Hancock on the Ontario & Western, 160 miles from New York and 165 miles from Oswego. The maximum curves are 8 degrees. The grades, going north, in the direction of the heavy traffic, are broken for 17 miles, the maximum being 52 ft. per mile. For five miles there are heavy ascending grades 70 ft. per mile maximum. Then for about 15 miles there is a uniform ascending grade of 42.24 ft. per mile to the summit. Thence the grade descends for 14 miles at 84.5 ft. per mile. Thence for about 3 miles to the junction the grades are about 40 ft. up and 26 ft. down. The country is a difficult one, and the grades and curves are as favorable as on any of the competing lines, and more favorable, we believe, than on most of them. The location of the southerly end for 13 miles was particularly difficult, as the valley is narrow and filled with railroads, coal mines and towns. In this distance there are nine crossings of other tracks, under or over grade, four crossings of the Lackawanna River and eight under or over crossings of highways. These bridges and viaducts are all of iron and masonry. On the northern end of the new line there is an iron bridge 65 ft. high and 510

ft. long over Cadosia Creek, and one 70 ft. high and 895 ft. long over the west Branch of the Delaware and the Erie tracks.

The whole line is excellently built. Nearly all of the bridges are of iron, the rails are 67 lbs. per yard; half the ties Georgia pine and the rest oak and chestnut. The stations were specially designed for their localities, and are unusually handsome and convenient. There are about 10 miles of sidings and yard tracks. When the road was opened in July it was in remarkably fine condition for a new line and was actually ready for work. As we have said, 25,000 tons of coal was carried the first month and a passenger service was at once established, with four daily trains between Hancock and Scranton and 10 between Carbondale and Scranton. These, we are told, are doing a good local business.

The cost of this branch without equipment will reach about $2,500,000; equipped, it will cost about $70,000 per mile. This is provided for by the issue of first mortgage consolidated 5 per cent. bonds covering all the property of the Ontario & Western, including the stock of the corporation which built the Hancock branch. The issue authorized is $10,000,000, of which $4,400,000 is to be devoted to retiring the existing 6 per cent. first mortgage bonds, and $3,500,000 to paying for the Hancock extension, for equipment and for the "Zig-zag" tunnel now building. This tunnel is about 27 miles north of Hancock. It is about 1,400 ft. long, or, including approaches, 5,300 ft. It will save two miles in distance, some very heavy grades and, it is estimated, $18,000 a year in operating expenses. The remaining $2,100,000 of the consolidated bonds will be available for improvements as needed. Much has been done in recent years to improve the permanent way, and further preparations are making for handling the coal business. At Oswego an additional coal trestle is building which will double the capacity at that terminal. At Weehawken a trestle is building, to cost $250,000, to be operated by link belt hoisting machinery. At Oneida a transfer trestle is building to transfer coal from the cars of the New York, Ontario & Western to the westbound empties of the New York Central and the West Shore. At this place the Ontario & Western has a yard between the tracks of the other two roads, its track crossing theirs under grade. In this yard a trestle is building, upon which the loaded coal cars will be run. Suitable connection will be made with the tracks of the other roads, by which their cars will be run under this trestle and loaded. This arrangement will give the Ontario & Western the first chance at the westbound empties of the New York Central and the West Shore, and will give those roads a longer haul west than on any other coal coming to them from the anthracite fields. The arrangement will, therefore, be mutually advantageous.

In other particulars the Ontario & Western has especially good facilities for distributing coal. About two-thirds of its business now goes north from Hancock, and is sent to the lakes, to Canada and to Rome, Utica, Watertown and other Central New York towns. At Campbell Hall this road connects with the Poughkeepsie Bridge line, and it is already sending a good deal of coal into New England. It has a good water front at Cornwall, and coal docks at that place are now under consideration. At Weehawken it has tidewater terminals.

On the whole, the sanguine expectations of those who have hoped by building the Scranton branch to put new life into the New York, Ontario & Western and to start it on a career of prosperity seem to be justified, for they have tapped a country of great and growing commercial and manufacturing importance. The output of the Wyoming coal fields in 1889 was 18,648,060 tons, or 53 per cent. of the total anthracite production of the United States. The product of steel rails in Scranton in 1888 was 326,590 tons, or over 1,000 tons every working day. In the valley are immense banks of culm, the value of which as fuel has only lately been understood, but the use of it is now increasing with great rapidity. It is claimed that this is the cheapest fuel in the world—cheaper even than natural gas. The increasing utilization of this fuel gives a new importance to the Scranton region as a manufacturing centre, and in the growth that is undoubtedly in store for that region the railroads will find a traffic increasing in variety as well as in quantity.

Five years ago the electric motor as a means of propelling cars and driving machinery had few advocates, and it was for a long time up-hill work to bring conservative minds to a realization of its merits. There are now in operation 260 miles of electric railroads, which is five miles more than that operated by cable, as shown by the recent Census Bulletin No. 11, which covers street railroad transportation—a new field in national statistics—and brings forward information which can but be a surprise to those who have not been conversant with the progress of the electric motor in street railroad work. With reference to the mileage of city railroads, it is said that the returns from 286 roads give a total mileage of 3,151 miles, which is an increase of 1,462 miles since 1880, or at the rate of 146 miles per year. Ten years ago the total mileage was 1,689, and it has nearly doubled since that time. Sixty-one miles are operated by steam on elevated structures, and 221 miles by steam on surface roads. Philadelphia has the largest mileage, 283; Boston next, 200; then follow Chicago with 184, New York with 177, and Brooklyn with 164. Chicago has the greatest length of double track, 176 miles; New York next, 161 miles. The total number of street railroads in independent operation at the first of this year was 807. From these figures it will be seen that electric propulsion for street railroads is increasing in use rapidly, and its success in Boston gives ground for the belief that it is the coming method of propelling street cars in preference to all other systems, for towns where overhead wires are permitted, and that as soon as a fair trial is given of the conduit system of carrying the electric current such roads will replace cables in crowded cities. There is in operation to-day in Allegheny City a conduit system, which is very successful, and, in spite of the recent failure of the conduit experiment in Boston, it is yet the belief of many electricians that the work was not properly done and the system was not fairly tried.

Last Sunday the New York *Sun* published the confessions of two men, Cain and Buett, of the details of the train wrecking on the New York Central & Hudson River. A third confession, that of Reed, is not published, but is said to confirm the others. The story is one of rascality and drunkenness, but unfortunately it does not actually fix the responsibility for the wreck of the Montreal express, and is probably insufficient to convict Kiernan of the attempt to wreck a train west of West Albany. There is strong evidence in the confessions that he is a desperate fellow and was determined to wreck a train without regard to the loss of life. The story of his fixing ties on the track between West Albany and Karner is circumstantial, and it is highly probable that he and Cordial caused the Castleton wreck. Lee is also shown to have been accessory to both wrecks, after the fact at least, and to have given the poor, drunken "Knights" money with which to get away. But unless further evidence can be had it is not likely that Lee or any other ringleaders will get his deserts. The most that can be done will be to punish the three who have confessed for tampering with a switch which did not cause a wreck. Meanwhile the whole story shows a state of morals and manners which is shocking and discouraging to every real friend of those among railroad employés who are commonly classed as workingmen. Nothing more than Lee's evidence before the State Board of Arbitration was necessary to convince all sane men that he is an irresponsible blatherskite; but these latest stories show the leader of the men in their late strike to be actually an uncaught felon.

We call particular attention to the announcement in another column of the coming meeting of the Superintendents' Society, to be held in New York Oct. 7. Papers and reports on important subjects are announced, and it is hoped that there will be a large attendance. This is a society which has done good and important work, but has never had the membership and influence to which the rank and intelligence of its members entitle it. It is now in a prosperous condition—probably it has never been more so—and there is reason to hope that it will take its proper place as one of the most active and influential of the railroad associations.

There were two errors of statement in our editorial of Sept. 12 on the tests of the Baldwin compound and standard locomotives. The locomotives weighed about 36 tons on the drivers and the total weight is about 52½ tons. At high speed the saving was 5.5 per cent. of steam and there was a saving of 14.9 per cent. in fuel. This last is the percentage which should be compared with the 30 per cent. of saving which it was stated in the report might be expected at slower speeds.

Swing Beam and Rigid Trucks, and Flange Wear of Wheels.

The first meeting of the Western Railway Club for the season of 1890-91 was held Sept. 16, 1890, President Hickey in the chair.

The subjects, "Relative Cost of Maintaining Rigid Centre and Swing Beam Trucks of Freight Cars," and "What has been Observed as to Comparative Flange Wear of Wheels," having been combined at the last meeting of the club in May, 1890, and referred to a committee consisting of Messrs. Wm. Forsyth, C. A. Schroyer and P. H. Peck, were taken up for discussion. In the absence of Messrs. Forsyth and Schroyer, Mr. Peck read the following notes.

The committee has never had a meeting; but I will give you my views and observations so as to get the matter before the club. I have never had experience in maintaining the two kinds of trucks on cars, but have had some experience with them on tanks, and have found the result largely in favor of rigid centres. My observation and records of defects in cars to show more truck defects with the swing beam than with the rigid beam. The records of expense of repairing trucks also show more repairs made on swing beam trucks than on the rigid. As near as I can estimate, there are not less than 10 per cent. more defects shown on our records in the swing beam than in the rigid beam truck. Most of the defects in the swing beam truck were, however, where wooden transoms were used and hangers slotted through the transoms. I also found a great many of the lever hanger pivots bent, with keys lost out of them, which is liable to let the spring plank down between the rails. This frequently derails the cars.

I find that, after a car has run some time with iron transoms, the transoms are more or less widened at the top, bending the top swing hanger pivot, and bending the top of the iron transom at the pivot bearing; and when this bending is bad, the truck frame has to be taken to pieces and rebuilt.

A great many of the swing beam trucks are built with a short side bearing, and when the spring weakens on the trucks the side bearing on the body of the car rests on the wooden transom, which will not allow the car to curve on any short crossover. I also find more loose and broken centre castings and truck sides on swing beam trucks.

The first cost of the swing beam is more, and in service there are nine different parts on each truck that are liable to break or give out (disabling the car) to one on the rigid. We have four hangers, four rocker pins, and spring plank, each of which, if broken, is liable to derail the car. In the rigid beam we have only the spring plank.

In regard to flange wear, I have not noticed much difference, but think flange wear in a great many cases is not due to the style of truck, but to an imperfect side bearing on truck and car. I do not see how some trucks curve at all with the side bearing they have. Only a few days ago I saw a small wrought strip of iron on a wooden bolster, the side bearings on both sides of car bearing hard against the strip until it was imbedded in the bolster half an inch. Such a car necessarily would be hard on flanges. I have also seen cars derailed with all the wheels of the car near the rail, having run only a few feet. In these cases it was impossible to put the car on the track with frogs until the car was raised and strips well oiled put between side bearings in order to let the trucks go over the frogs to get on the rail.

I think that many times we have cars off the track in the yards when no cause can be assigned why they left the rail, when the derailment was really due to an imperfect side bearing, one being high on the trucks with no weight, and some being light and carrying all the weight and fastened with two small lag screws which are always loose. Some are thin cast iron, and these are invariably broken if on wooden bolsters.

Mr. RHODES: Our experience with the swing beam and the rigid truck on the C., B. & Q. has led us recently, on the score of economy, to adopt the rigid truck in lieu of the swing beam truck, and to gradually abandon the use of the latter, as they require general repairs. We found that the parts of our trucks that were constantly needing more repairs than others were the hangers and the axles which are attached to the hangers. These axles were breaking so frequently that the question was raised whether we should not increase their size, and in raising that question there was incidentally brought up the question as to what was the use of the hangers. Why have them if they broke so frequently? This is a question which comes up often in mechanics. Take locomotive rod connections, for instance. We used to shear a great many bolts, break straps and lose keys, and in considering the remedy for this the question was raised, "Why have them at all?" If we can do away with the bolts, we won't have any bolts to shear. If we can do away with the keys and straps, we won't have any keys or straps to cause delays and expense. This same line of investigation we have applied to our swing beam trucks. Instead of increasing the dimensions of the hangers and axles, we decided to do away with them. The matter was considered on our proprietary lines as well as on the C., B. & Q. proper, and there never was a question brought up on the C., B. & Q. that was so unanimously decided as the abandoning of the swing beam truck. There was hardly a man that stood up to defend the swing beam truck. We have hundreds and hundreds of cars going over our lines every day with rigid trucks, so that we have had an ample experience with both kinds.

The question raised by Mr. Peck, as to whether there is not more flange wear with rigid trucks, I think can be answered pretty plainly by reminding you of the result of the Burlington brake tests. In the train resistance tests were cars fitted wholly with swing beam trucks, and some fitted wholly with rigid trucks. The train that offered the least resistance going around the curves and grades of that three-mile run was a train fitted with rigid trucks. If any of you wish to refresh your memories, you can turn back to the Master Car-Builders' Report for the year 1887, where you will find the full details.

One question that was asked when we looked into this matter was: Why is it that the swing beam truck has become so generally used in the West and is so little used in the East? The answer seemed to be that some years ago, when the roadbeds were not kept up so well as they are now, and when people were apt to be carried away by the advantages of some claim that one railroad might make over its competitors, the claim that trucks of a given road rolled smoothly over rough roadbeds owing to their swing beam feature, was used as a sort of incentive for people to ship their goods, especially stock, over that road, and other roads consequently put in the swing beam truck. But so far as our road is concerned, this line of argument has been shown to be a fallacy, and we have come to the conclusion that it does not cut any figure, and that the truck that requires the least repairs is very apt to be the one that has the fewest parts to it. It will be asked, Are you not some times required to run your cars at a very high rate of speed, and is it not advisable to have your truck constructed so that it will run at that high rate of speed? We say, Yes, and we consider our rigid freight truck safe for any speed and any train on our line. In confirmation of our belief in this, I may say that it was only the other day at Chicago that I saw one of our fastest passenger trains going out of the city, and immediately back of the engine there was one of our new freight cars fitted with our rigid trucks. This also tends to illustrate a point that is constantly presenting itself, viz.: the similarity of the two services, especially the fast freight trains and heavy through passenger trains. We have got to have our engines and the running gear of our cars, including brakes and couplers, pretty much the same for both services; at any rate they must be safe to go into either service, and we believe our rigid freight truck to be safe in either.

Mr. PECK: What I observed in the way of flange wear was mostly on old cars, where they had been allowed to run a long while in service. I found them bearing hard on the side bearings, so that it was almost impossible for the car to curve.

Mr. G. W. CUSHING: My experience has been rather in favor of the vibratory or swinging motion truck. In regard to the flange wear of wheels, I am quite certain it would be very much less with the swing motion than it would be with the rigid truck. The same would be true in regard to the wear of oil boxes and brasses.

President HICKEY: I remember my experience some years ago on a road, with which I was then connected, that adopted a swing truck for an engine truck. They made several and put them into the fast passenger service, and ran them six or seven or perhaps eight months. During the time the expense of trucks was increased at

least 40 per cent.; I think it was more than that. The swing beam not only added to the cost of repairs of trucks, but it loosened the boiler fastenings. They were finally obliged to throw the swing trucks out and go back to the old style, whereupon they had much better results. I was slow to believe that a rigid truck for a freight car was better than a swing beam, until some three or four years ago we bought a lot of cars for the ore service, all of which had swing-beam trucks. Shortly after we received the cars I looked into the wearing parts and I noticed that we were having a good deal of the trouble with the axles and hangers spoken of by Mr. Rhodes. Not only were many of these broken, but many were bent, and in order not too cause too much delay I was obliged to introduce thimbles—pieces of pipe tubing—that would go on to these axles and keep the hangers the proper distance apart. I rode on the freight trains several times, and when going at a speed of perhaps 18 or 20 miles the loose cars would sway so that they would appear to string all over the track. They were not only destructive to themselves, but they were equally destructive to the track. Shortly afterwards we got an order to build a large number of 60,000-lb. cars. I looked over the situation carefully and I got our master car-builder to consent to a rigid truck. I got figures on both trucks, the swing-beam and rigid, from car manufacturers, and I found that they would build a rigid truck of equal capacity as a swing truck for from 16 to 17 per cent. less. I have found that there is not less than 25 per cent. less cost for repairs of rigid centre trucks than of swing beam trucks. I reached my conclusions very slowly and was slow to adopt them, thinking that the cars would curve better with the swing beam and that they would be more easily hauled. I did find that the flange wear would have to be looked after very closely. I investigated the cause of the wear and found it to be the fact that the upper transoms of the cars were not properly sustained; when the load came they would settle down on the side bearings and bind, and the wheels were therefore quite subject to flange wear. But with side bearings having some margin of safety, I think you will have no trouble with the rigid truck, and I believe it is the coming car truck. I have had similar experience with locomotive tank trucks.

On motion of Mr. W. H. Lewis, the combined subjects of "Relative Cost of Maintaining Rigid Centre and Swing Centre Trucks on Freight Cars," and "What has been Observed as to Comparative Flange Wear of Wheels," were continued for further discussion at the next meeting of the club.

Papers have been promised as follows:

For October—"Steel tired wheels and the principles to be followed in attaching tire to centre," by Mr. G. W. Rhodes.

For November—"Draft rigging," by Mr. C. A. Schroyer.

For December—"Air brakes and vertical plane couplers in service for freight and passenger trains," by Mr. D. L. Barnes.

For January—A paper upon a subject not yet named, by Mr. John Hickey.

Papers had also been promised by Mr. J. N. Barr, Mr. P. H. Peck, Mr. W. H. Lewis, and partially promised by five other members.

The club next took up the election of officers for the season 1890-91, and the following gentlemen were unanimously elected to the several offices named:

President, J. N. Barr; *1st Vice-President*, C. A. Schroyer; *2d Vice-President*, P. H. Peck; *Treasurer*, Allen Cooke; *Secretary*, Walter D. Crosman.

The Chicago Railroad Problem.*

BY MAX E. SCHMIDT, MEMBER WESTERN SOCIETY OF ENGINEERS.

No person can live here six months and remain in ignorance, 1st, of the encroachments of the railroads upon the city's territory; 2d, of the effects of the terminal facilities, and 3d, of the inadequate arrangements for rapid transit provided for the population of this great city.

The railroad problem, which has been before you at several meetings, is still imperfect, and practically without a solution, even on paper. In reference to this problem, the suggestion has been made to propose a remedy that would be sweeping and complete, and then try to approach the same as close as possible.

It is in line with this suggestion that I shall lay before you, not a plan nor a scheme, but simply an idea or a suggestion of what a plan might be if the problem was to be eradicated forever. I refer to nothing less than to the possibility of uniting all the railways entering Chicago at a point five or six miles west from here, and provide one wide entrance, for the construction of an embankment, on which all the railroads may come in, side by side, on parallel tracks, and discharge in one commodious union depot.

Considering the geographical position of Chicago, whose entire east side fronts toward the lake, from which direction railroads cannot approach, such an arrangement would certainly be most desirable, provided it could be accomplished.

The deflection of the tracks toward the west begins (in this plan) in the southern division, at Calumet and, in the northern division, at Evanston. All roads are one by one gathered up, in such a manner that the growing line follows more or less closely the present Belt Line Railroad. That is to say, each railroad, as it approaches the Belt Line, in place of crossing the same, makes a turn and occupies the outside of the tracks already in place. When the stem is reached, all tracks turn back east to occupy the avenue that has been provided for their common entrance into the city.

This would bring into existence one broad and many tracked belt railroad, on which the Pittsburgh & Fort Wayne in the southern division, and the North Western in the northern division, would occupy the inside tracks. Every railroad would remain independent, but have direct track communications with its neighbors. There would be practically no grade crossings within the city limits, no delays, no gates and no accidents. All freight not destined for the city proper would be shifted at the Chicago Union Transfer Yards, while for the handling of Chicago freight track space and sheds could be provided on wings of the elevated embankment near the terminus.

The embankment should be so constructed that the railroad problem would thereby be disposed of forever. For that reason the first three or four miles west of the terminus should be composed of a solid earth embankment, raised to an elevation of at least 15 ft. above street grade, and held in place by two strong masonry retaining walls. All streets running parallel with the embankment, as far as covered by the same, should be closed, while communication between streets running transversely should be kept open by means of masonry archways lighted by electricity. Beyond the three or four mile lines, or wherever property ceases to be very valuable, retaining walls could be dispensed with and the embankment constructed with ordinary side slopes. At the same time its elevation could be decreased to 9 ft. above the street grade, and the archways, extending transversely through the same, could be depressed sufficiently to make up the difference. This elevation should be retained until the embankment leaves the city limits.

The magnitude and absoluteness of the change outlined precludes the possibility of rendering an estimate of its cost, at this stage. But a brief analysis of the proposition may be given, as it will reveal at once its chances, if any, of ever becoming realized, in whole or in part, and in this shape, or any modification thereof. Referring first to the items of grading, bridging and masonry, it is, of course, much cheaper to place, say, seventy tracks on one embankment than to place each one on a separate one. In this particular case, Mr. Robinson estimates the cost of four-track viaducts at $1,106,000 for metal, and at $706,000 for masonry viaducts, per mile, respectively. At this rate one mile of seventy tracks, placed on viaducts of four track capacity each, would cost $19,355,000 and $12,355,000 respectfully. To place the same number of seventy tracks side by side on one common embankment, 1,000 ft. wide, and of the class I have described, would cost only about $3,300,000 per mile, or slightly more than one-fourth of the smallest of Mr. Robinson's estimates. In this sum earth is estimated at 50 cents, and retaining wall masonry at $6 per cubic yard, and no allowance has been made for debris from houses to be removed, which would necessarily assist in reducing the cube of the fill.

Referring to the suggestion of raising or depressing separately all the tracks within the populous parts of the city, little has been said how this is to be done without obstructing the enormous daily traffic of each road thus treated. A plan that would permit the railroads the undisputed use of their right of way during the process of raising or depressing the tracks would seem very desirable, and it may be said that under the proposition of uniting the tracks, as outlined in this paper, the existing railroad traffic would not be molested. The chief argument against the change would be the immense value of the property which the railroads have acquired within the city limits, and the pretended uselessness of this property for any but railroad purposes; also, because of the many industries, which are now dependent upon track room in the very heart of the city, and which would be cut off from their base of supplies if the railroads were withdrawn.

The present value of the railroad property in the city limits is placed all the way from sixty to two hundred million dollars, distributed over twenty-nine different railroad lines, which enter Chicago on sixteen distinct rights-of-way, covering many square miles of the most valuable city property. All this property would become vacant were the railroads to be transferred, but its character would seem to indicate at once its usefulness for purposes of suburban rapid transit, by cable or elevated roads, and greatly facilitate the acquirement of the right-of-way for these purposes. A large part of the vacated property would be disposed of in this manner, while the rest would become available for streets and building lots.

As regards the industries, no thoughtful person will dispute the superior part which they play in the Chicago railroad problem. Each railroad penetrates with a network of yard and spur tracks into the various industrial quarters of the city and depends upon them for traffic, as the tree does for nourishment upon its roots. The industries look therefore upon their present locations as fixtures and, with the power, incident to the large investments represented, are solid against any attempts to disturb them and interfere with their present track facilities. This point was illustrated, I am informed, when some time ago the desire of a railroad line to elevate its tracks at a complicated crossing in this city was frustrated through the pressure brought to bear against the measure by the industries near by.

The problem is thus brought to the very door of the industries, with the absolute certainty that it must grow vastly more complicated in the future, if the preponderance of the industries is conceded and their disturbance considered altogether impracticable. If such a measure as was outlined in this paper would be adopted the natural course of events would lead the industries to follow the railroads to where tracks could be provided for them, and the difference between central and suburban property would go a long way toward paying for the expense of their removal. For the city, their disappearance would not necessarily be a loss, if for no other reason but that their departure would result in the removal of at least one of the causes that combine to make this city one of the smokiest and dirtiest in the country.

In conclusion, it should be stated that the idea suggested here admits clearly of modifications. Thus, in place of conducting all the railroads into one artery, for their joint entrance into the city, it may be that existing interests would be served better by dividing them into groups, one southern, one western, and one northern, and carry each one into the city on separate embankments, for which routes might be selected that would touch most of the existing industries and elevators, providing them with tracks from short inclines, leading down from the embankments. Or, it might be suggested to carry the central stem out to a point three or four miles beyond the city limits, and let the union of tracks take place there, which would make the line straighter, grading less expensive and remove more crossings.

* From the *Journal of the Association of Engineering Societies.*

TECHNICAL.

Manufacturing and Business.

The offices of the Westinghouse Air Brake Co., in Allegheny, Pa., have been removed to Wilmerding, Pa., where the new plant is located. All the machinery has been removed from the old works. The general offices will be located temporarily until the general office building is completed. There will also be an office of the Company in the Westinghouse Building, in Pittsburgh.

The Standard Underground Cable Co., whose works are now located in Pittsburgh, will erect buildings and remove its plant to Wilmerding during the early part of next year. The shops in Allegheny vacated by the Westinghouse Air Brake Co. will be occupied by the Fuel Gas & Electric Manufacturing Co.

The Eucalyptus Boiler Compound Co., of Chicago, has been incorporated in Illinois for the manufacture and sale of a compound to prevent the incrustation of boilers; capital stock, $500,000; incorporators, Sidney H. Stevens, Davis R. Boogher and Mahlan S. Frost, of Chicago.

Iron and Steel.

Riter & Conley, of Pittsburgh, have received the contract for the erection of a third furnace for the Colorado Coal & Iron Co., of South Pueblo, Colo. The furnace will be 17 × 17 ft. in size.

Hugh M. Bole, of Pittsburgh, has just completed the fourth of eight immense ladles for Carnegie, Phipps & Co. The ladles are for the Bessemer department of the Homestead Works, and are 8 ft. 4 in. in diameter at the top and 7 ft. deep, having a capacity of 40 tons.

The Apollo Iron & Steel Co., of Apollo, Pa., has just completed the erection of a new sheet mill as an addition to its plant, and ground has been broken for three more sheet mills and a plate mill. A tin plate mill is also contemplated.

The 16-inch bar mill at the Gautier department of the Cambria Iron Works, Johnstown, Pa., has been recently put in successful operation.

The blast furnace of the Riverside Iron Works, at Steubenville, O., which has been undergoing extensive repairs for some time, has resumed operations. The furnace is practically a new one, and the output is expected to show a good increase.

Furnace A, of Carnegie Brothers & Co. (Ltd.), at Braddock, Pa., which has been undergoing repairs for some time, resumed blast on Sept. 11. This stack is operated on spiegel exclusively, and produces about 850 tons per week.

The Illinois Steel Co. expects to have two of its new stacks in operation in October, and the other two will probably be completed and put in blast by January.

The Iroquois Furnace Co.'s blast furnace near Chicago is under construction and considerable work has already been done, but it will not be completed much before next spring.

D. R. Lean, of Pittsburgh, Pa., has contracted with William M. Kaufman & Co., of Sheridan, Pa., for a plant of two Ford & Moncure fire brick hot blast stoves 20 ft. in diameter by 60 ft. high, with an iron draft stack 7 ft. in diameter by 130 ft. high.

The Fort Payne Furnace, No. 1, at Fort Payne, Ala., went into blast recently. The furnace is now running on a mixture of 50 per cent. brown ore, 25 per cent. red hematite and 25 per cent. soft hematite.

The annual meeting of the stockholders of the La Belle Iron Works, of Wheeling, W. Va., was held on Sept. 9. The following directors were elected: John Wright, A. J. Clarke, W. T. Burt, Harry L. Doty, John J. Jacob, W. R. E. Elliott and C. A. Robinson.

The annual meeting of the stockholders of the Thomas Iron Co. was held at Hokendauqua last week. All the furnaces were in average blast 48 weeks of the year and the average production was 336 tons per week per furnace, the total product being 175,170 tons, an increase of 19,505 tons over the previous year and the largest output ever made by the company. The deliveries of iron were 183,153 tons, against 143,166 in the preceding year. The net income from all sources was $420,065, or about 21 per cent. on the capital stock of $2,000,000, or $2.29 per ton profit on the pig iron produced. The total surplus is $1,782,591. The 7 per cent. bonds due July 1 have been retired, and new 5 per cent. bonds issued to the amount of $300,000. Besides the regular cash dividend, a 25 per cent. dividend in script was distributed during the year. The following board of directors were elected: Samuel Thomas, B. G. Clark, J. T. Knight, Daniel Runkle, Samuel Drake, Charles Stewart and W. W. Marsh.

At the sale of the property of the Crown & Cumberland Steel Co., of Cumberland, Md., Sept. 18, under decree of the Circuit Court, the crucible steel plant, rolling mills, machinery, &c., were sold to attorneys for Thomas A. Hicks, W. C. Dickey and R. B. Sidell, for $38,000. Most of the personal property, consisting of steel ingots, bars, tools, etc., was also sold to the same parties. The whole sale amounted to about $42,000. The purchasers are dealers in and manufacturers of crucible steel products in Philadelphia.

The Rail Market.

Steel Rails.—None of the mills report any important sales, and while there are some inquiries there seems to be little prospect for any new business for the immediate future. Many of the mills are sold well ahead. Quotations are nominally: At New York, $30@$30.50; at Pittsburgh, $31@$31.50; at mill and at Chicago, $33.50.

Old Rails.—The quotations are: At New York, $25@$26, 400 tons of foreign being sold at the former figure; at Pittsburgh, $28@$28.25, and at Chicago, $27, nominally for old iron rails, and $18.50@$22 for old steel rails.

Panconst's Ventilated Car.

Mr. R. M. Pancoast, C. E., of Camden, N. J., the designer of the ventilated fruit car illustrated in the *Railroad Gazette* April 11, writes us that the long trials and careful observation of his car on the Pennsylvania Railroad have enabled him to overcome the only two objections found: one being the danger of the intake devices on the side of the car being knocked off. He now places the intake on top of the car, where it works better in all respects. The other objection (being the alterations in freight-car doors) he now eliminates by not changing or interfering with the ordinary doors in any way. The Baltimore & Ohio car, now being fitted up, includes these improvements and lessens the expense of alteration. The Baltimore Fruit Co., of Philadelphia, in loading the car of the Pennsylvania with bananas this week, found the capacity of the car increased for bananas about as 5 to 7. The bananas are loaded uniformly from end to end, which is not done in the middle of ordinary cars on account of the sunlight, etc., at the open doors.

A Cheap Electric Light Supply.

The town of Trente, Austria, owns an electric light station run by water power from a waterfall under favorable conditions. The light is furnished to private consumers at the rate of 50 kreutzers (about 20 cts.) per year per candle power, no regulation being made as to the number of hours. To put the electric light within reach of the poorer inhabitants, the house wiring done by the town may be paid for in annual payments. The station also supplies mechanical power to a flour mill and a spinning mill at 40 florins ($16) per horse power per year.

Leather Brake Shoes.

Trials have been made at Sydney, New South Wales, of brake shoes made of leather. The material is leather scraps subjected to chemical treatment and hydraulic pressure. Mr. D. H. Neale, Engineer to the Commis-

sioners of Railways, after careful tests, reports that the life of the leather brake shoe is nearly three times that of iron and the wear upon the wheels is very much less. The leather shoes weigh about one-fifth as much as iron.

American Solid Steel Wheel.

Tests were made of this wheel at Boston, Mass., Aug. 28, in the presence of a number of railroad men. A 33-in. wheel was placed on iron blocks, the rim resting on each block. A weight of 525 lbs., falling 11 ft., struck the hub 25 times without any effect except battering the metal. It was then dropped 10 times on the rim, without a fracture. Then a weight of 1,400 lbs. was tried, falling 17 ft. This struck the wheel 11 times, but failed to break it. At another exhibit, in order to test the effects of expansion and contraction, a wheel was buried in sand, and a charcoal fire built around the tread until it was brought to a red heat. Then it was taken out and cooled in the air with no bad effect. This wheel is in service for trial on several of the New England roads, the Manhattan Elevated in New York and several Western roads.

The Manitou & Pike's Peak Railroad.

A letter of Sept. 15 informs us that at that date this road (described in the *Railroad Gazette* April 4, 1890) was completed to within 10,000 ft. of the summit, and it was hoped that it would be finished early in October. There have been many unforeseen delays, partly from delays in delivering the material and partly from the difficulty in getting workmen, as not all men can stand it to work in that high altitude. Four loads a day are taken up, by two engines, each load consisting of 210 ft. of complete track. The round trip to the front, about 7 miles each way, with the construction car, weighing about 45,000 lbs., is made in from four to four and one-half hours, including all stops for water, unloading, meals, etc.

The passenger cars are said to be a great success in comfort and elegance, and the engines do all that they were expected to do. The road was opened for passenger traffic as far as the Half-Way House Aug. 15, but traffic stopped again Sept. 1, as the trains delayed somewhat the work of construction and were hardly remunerative.

THE SCRAP HEAP.

Notes.

General Manager Pugh, of the Pennsylvania Railroad, has awarded Supervisor James R. Smith, of Subdivision B, New York division, the first prize of $100 for the best kept lines and surfaces on any subdivision between Jersey City and Pittsburgh, and J. B. Baker, of Subdivision No. 2, Philadelphia division, the second prize of $50.

The Chicago, St. Paul & Kansas City put a force of 90 men at work last Sunday laying a side track at Marshalltown, Ia., upon private property, over which it had failed to obtain the right of way from the landowners. The men were arrested for violation of the Sunday law, and work was not resumed.

What's in a Name?

The General Grievance Committee of Engineers on the Chicago & Northwestern have changed their name to the General Adjustment Committee.

Sunday Freight Trains.

Judge Diggs, of Lynchburg, Va., delivered a very important opinion Wednesday concerning the passage of railroad freight trains on Sundays. There is a Legislative enactment imposing restriction on such transit. The case bringing forth the opinion was the city of Lynchburg against the Chesapeake & Ohio for breach of the law. Judge Diggs pronounced the law unconstitutional, the facts being that the company did run its freight trains on Sunday as charged, but they were engaged in carrying merchandise from other states into and through the territory of Virginia, and, therefore, under the Interstate Commerce Law, by all the decisions of the highest courts thereon, railroads cannot be restricted in their transportation.

A National Transportation Committee.

Secretary Stone, of the Chicago Board of Trade, has issued an official call for the organization meeting of the National Transportation Committee. In the words of Mr. Stone, "The new association will have jurisdiction over every act between any shipper and any carrier. The injustice to one will be the concern of all. The organization meeting was to be held in Chicago on Sept. 25."

Evening Class in Steam Engineering.

The Young Men's Institute (Y. M. C. A.), of No. 222 Bowery, New York City, has for the past two years supported a class on the theory and practice of steam engineering, which has been conducted by Mr. William H. Weightman, M. E. The class will be continued this year under the same instructor, meeting on two evenings of each week. The fee is but 50 cents a month to members of the Institute. The instruction is on the practical operation of engines, boilers and machinery and the principles of steam engine and boiler practice.

Harris Palatial Car Co.

The annual meeting of the company was held at Portland, Me., Sept. 18, when the following officers were elected: President, Edwin E. Perkins; Vice-President and General Manager, Louie J. Harris; Treasurer, Albert C. Burrage; Secretary, Luther M. Harris; Directors, Edwin F. Perkins, Louie J. Harris, Albert C. Burrage, Luther M. Harris, Arthur W. Crossley, W. W. Carter, G. A. Denham, Boston; C. J. Seymour, Brookline; Chester T. Linley, Spencer, Mass.; G. H. Poor, T. P. Shaw, Portland. Mr. Thomas P. Shaw is the Paymaster of the Maine Central. Mr. Geo. H. Poor has been 25 years in the railroad service. He was Manager of the American Brake Co. of St. Louis for six years, and Master Mechanic of the Portland & Ogdensburg nine years.

The Shoemakersville Disaster.

Northbound express train No. 3 on the Philadelphia & Reading was derailed on the evening of Sept. 19, about six o'clock, half a mile from Shoemakersville, Pa., and the engine and five cars were precipitated into the Schuylkill River, killing 21 and injuring 30 persons, five of them being employés. The wreck was a very bad one, the track being some 20 or 30 ft. above the river, and some of the cars being partially submerged; many of the deaths were from drowning. Many of the bodies of the victims were not taken out of the wreck until the second day. The derailment was caused by a rear collision of coal trains on the southbound track, some of the cars being thrown over in front of the express train and the latter coming upon them before there was time to send out a danger signal.

A coal train of 150 cars broke in two about 100 cars back of the engine. Another coal train of the same length, following about 10 minutes behind, ran into the rear of the first before it could be got under way again. The caboose and one or two cars were derailed, and part of the wreck was thrown over upon the passenger track. The evidence is not clear as to how much time the flagman of the first coal train had to get back with his flag, and as to how far he actually went back. It is probable that he had about 10 minutes to go back, and that he went about 200 yards. The view from the first train was shortened by a cut and a curve, and the grade was descending, consequently it was impossible to stop the train after the flag was seen. The express train reached the wreck almost simultaneously with the collision with the freight train. The coroner's jury censured the flagman of the first train for not getting out and putting down torpedoes while the train was losing time. It was his duty under the rules to do this when a train was not running more than three miles an hour. The trains passed Perry, two miles from where the accident occurred, 12 minutes apart.

From the testimony of the runner of the first train it appears that he struck a torpedo several hundred yards north of where the accident happened and had slowed down and "drifted" past the Shoemakersville station, but he put on steam again just before the break-in-two. He was running about 10 miles an hour when he passed Perry, two miles north of Shoemakersville. He thought that the express train was running from 50 to 55 miles an hour when it passed him.

The engineer of the second coal train testified that the signal was seen about 500 yards before the rear of the first train was struck. He applied the driver brakes, but could not stop. He was running 10 to 20 (others say 10 to 12) miles an hour and could have stopped in 1,200 yards. The flagman could have got back to where he was seen in three minutes.

High Speed on the London & Northwestern.

When recently returning from Edinburgh by the West Coast route, I recorded no less than six miles averaging 80 miles an hour. Three miles down Shap were run in exactly two minutes and fifteen seconds, and three more down Grayrigg in precisely the same time. The engine was of the President type, 6 ft. 6 in coupled drivers, cylinders 17 in. × 24 in., and the load about ten coaches, or say 120 tons. The line falls 70 ft. per mile for about four miles from Shap Summit, then another one and one-half to two miles at about 40 ft. per mile, after which there is a rise to Grayrigg Summit, 26½ miles, from Lancaster, where begins a fall of about 44 ft. per mile, continuing for 14 or 15 miles. The following are the times as recorded:

Miles from Lancaster.		M.	S.	Seconds per mile.	Speed.
37½	Shap Summit	0	0		
37		0	33	33	
36		1	30	57	
35		2	18	48	75
34		3	03	45	80
33		3	47	44	81.8
32		4	33	46	78.26
31		5	21	48	75
Slack at Lowgill					
23		14	19		
22		15	08	49	73.4
21		15	57	49	73.4
20		16	45	48	75
19					
18		18	17	46	78.26
17		19	01	44	81.8
16		19	46	45	80
15		20	32	46	78.26
14		21	18	46	78.26
13		22	04	46	78.26
12		22	52	48	75

The slack at Lowgill may be taken as involving a loss of quite one minute. Posts 35 to 32 and 18 to 15 were done at an average of 80, posts 20 to 13, or seven consecutive miles, were done at an average of 79, and posts 36 to 31 and 21 to 12, or 14 miles altogether, were done at an average of 78. I was sitting in a compartment of an eight-wheeled coach weighing about 19 tons. Notwithstanding the extraordinary speed the absence of oscillation conclusively testified to both the carriage itself and the permanent way being in a state which it would be unhandsome not to describe as perfection. I except, however, from this remark a piece of line a few miles south of Oxenholme, where, for some reason or other, for about a quarter or half a minute, the train rocked considerably. But for this trifling exception there was nothing, so far as any motion of the carriage was concerned, to tell the passenger whether he was going 80 miles an hour or 18.—Correspondence of W. C. H. Church in *Engineering*.

A Passenger Train Wreck

At eight o'clock p. m., Sept. 21, a bad collision took place between two passenger trains in Chicago. An excursion train of the Illinois Central was standing, blocked, on the track of the Chicago, Burlington & Quincy. A suburban train of the latter road ran into the rear of the excursion train, telescoping three cars, killing seven people and injuring a large number. We have not yet learned the cause of the collision.

LOCOMOTIVE BUILDING.

Three new 10 wheel engines have just been received by the Western of Alabama. They have 18 × 24 cylinders, and weigh 165,000 lbs. each.

The Baldwin Locomotive Works have an order for two locomotives for the government road at the Cape of Good Hope, Africa.

CAR BUILDING.

The Savannah & Western division of the Central of Georgia this week received four new passenger cars from the Ohio Falls Car Co.

The South Baltimore Car Works will soon begin the delivery of 500 box cars for the Baltimore and Ohio. Eight or ten cars will leave the shops daily. The contract was given out the past summer. The cars are 34 ft. long and have automatic couplers and air brakes. They will be painted green and marked with a white shield, which, it is stated, will mean that they are to be used for transporting general merchandise.

The shops of the Minnesota Iron Car Co. at West Duluth, Minn., will be running with a full force of men in all departments on Oct. 1. Under the reorganization the officers are: J. F. T. Anderson, President; Col. W. E. Tanner, General Manager, Secretary and Treasurer, and R. L. Ettinger, Superintendent. The company starts with a large order for the Iron Car Equipment Co.

The representative of the Colonial Government railroads of the Cape of Good Hope now in this country has placed an order for 12 iron tubular cars with the Iron Car Equipment Co., of New York.

The Oregon Improvement Co. has been building a large number of freight cars for different roads in Washington at its Seattle shops. It has a contract to build a number of cars for the Columbia & Puget Sound which has been completed with the exception of 30 coal cars, and also a contract for the construction of 30 logging trucks for the Port Townsend & Southern and have just completed five box cars for this road. Five box cars for the Seattle & Montana have recently been constructed and shipped to Anacortes. During the past month they have turned out 29 cars for the different roads, as follows: Six platform and 13 coal cars for the Columbia and Puget Sound, five box cars for the Port Townsend & Southern and five box and 20 logging cars for the Seattle & Northern.

BRIDGE BUILDING.

Buena Vista, Va.—The West Buena Vista Co. has contracted with the Pittsburgh Bridge Co. for an overhead iron bridge to commence at the intersection of Sycamore avenue and Twentieth street, and cross above both the railroad tracks and the yard and side tracks of the Buena Vista Iron Co.

Burlington County, N. J.—Nine bids were received for building the iron drawbridge over the Mullica River, between Burlington and Atlantic Counties. The lowest bid was $29,000, from Dean & Westbrook, of New York.

Helena, Mont.—Bids are invited for the construction of a bridge, 50 ft. span, across Ten Mile Creek, on the old Benton road. Bids to be accompanied by plans and specifications, and will be received by J. S. Tooker, of Helena, Mont., until Oct. 15.

Malden, Mass.—The contract for the iron bridge of the Boston & Maine, at Malden, has been awarded to J. Ellis.

Portland, Or.—Kilpatrick Bros. & Collins, contractors for the Portland & Seattle extension of the Union Pacific, have let a contract to N. J. Blagen, of Portland, for the construction of all the trestle bridges on the road from Portland to Seattle, also the furnishing of all ties, timber, iron and all other material needed.

Seaford, N. J.—A steel bridge has been built across the Nanticoke River, at Seaford, by the Delaware Railroad, in place of the old wooden structure. The new bridge is 176 ft. long.

Various Projects.—The Western New York & Pennsylvania has erected the following new iron and steel bridges: Oil City, two spans, iron, length, 306 ft.; Petroleum Centre, two spans, iron, length 304 ft.; Warren, three spans, steel, length, 528 ft.; Larabee, one span, iron, length, 154 ft.; Oswayo Creek, one span, iron, length, 133 ft.; Tuscarora, one span, iron, length, 100 ft.; Rochester, one span, iron, length, 67 ft.; Rochester, one span, iron, length, 106 ft. Contracts have been awarded for the following: Allegheny, two spans, iron, length, 328 ft.; Arcade, one span, iron, length, 119 ft.; Franklinville, one span, iron, length, 108 ft.; Portville, one span, iron, length, 68 ft. These bridges, except the two at Rochester, replace wooden ones. It is intended to substitute iron and stone structures for those now of wood as fast as renewal is required.

Washington, D. C.—The Senate has passed the following bridge bills: For a railroad bridge across the Illinois River between Columbiana, in Greene County, and Farrowtown, Ill.; Mobile, Jackson & Kansas City to cross certain rivers in the state of Mississippi; to authorize the construction of a bridge across the Alabama River at Selma, Ala., by the Selma & Catawba Valley Railroad; to authorize the Canaveral & South Florida Railroad to construct a bridge across the Indian River and one across the Banana River in Florida; to authorize the Cairo & Tennessee River Railroad Co. to construct bridges across the Tennessee and Cumberland rivers; to authorize the construction of bridges over the Savannah, Ocmulgee and Oconee rivers by the Macon & Atlantic Co.; to authorize the construction of a bridge across the Savannah River by the Middle Georgia & Atlantic Co.; to authorize the Chicago, Henderson, Bowling Green & Chattanooga to construct a bridge over Green and Barren rivers, in Kentucky, with amendments.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Alabama & Vicksburg, 3 per cent., payable Nov. 1.
Chicago, Rock Island & Pacific, quarterly, 1 per cent., payable Nov. 1.
Cincinnati, New Orleans & Texas Pacific, 2 per cent., payable Oct. 22.
Nashville, Chattanooga & St. Louis, quarterly, 1¼ per cent., payable Oct. 13.
New Castle & Beaver Valley, 3 per cent., payable Oct. 1.
Sunbury & Lewistown, 4 per cent., payable Oct. 1.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Alabama Great Southern, annual, Birmingham, Ala., Oct. 1.
Alberta Railway & Coal Co., special, London, Eng., Oct. 15, to ratify the purchase of the Northwestern Coal & Navigation Company's property.
Annapolis & Baltimore Short Line, annual, Baltimore, Md., Oct. 8.
Boston & Providence, annual, Boston, Mass., Oct. 8.
Carolina Central, annual, Beach and West streets, New York City, Oct. 9.
Chesapeake & Ohio, annual, Richmond, Va., Oct. 21.
Cincinnati, Jackson & Mackinaw, annual, Van Wert O., Oct. 1.
Cincinnati, New Orleans & Texas Pacific, annual, Cincinnati, O., Oct. 20.
Cleveland, Cincinnati, Chicago & St. Louis, annual, Cincinnati, O., Oct. 20.
Cincinnati, Sandusky & Cleveland, annual, Sandusky, O., Oct. 17.
Columbus, Springfield & Cincinnati, annual, Columbus, O., Oct. 21.
Cumberland Valley, annual, Harrisburg, Pa., Oct. 6.
Detroit, Grand Haven & Milwaukee, annual, Detroit, Mich., Oct. 6.
Evansville & Terre Haute, annual, Evansville, Ind., Oct. 20.
Great Northern, annual, St. Paul, Minn., Oct. 2.
Illinois Central, annual, Chicago, Ill., Oct. 8.
Knoxville Belt, special, 126 Gay street, Knoxville, Tenn., Nov. 1.
Knoxville, Cumberland Gap & Louisville, special, 126 Gay street, Knoxville, Tenn., Nov. 1.

Knoxville Southern, special, 126 Gay street, Knoxville, Tenn., Nov. 1.
Lake Erie & Western, annual, Bloomington, Ill., Oct. 1.
Lake Superior Terminal & Transfer, annual, Hudson, Wis., Oct. 4.
Louisville, Evansville & St. Louis Consolidated, annual. Belleville, Ill., Oct. 16.
Louisville & Nashville, annual, Louisville, Ky., Oct. 1.
Louisville, New Orleans & Texas, annual, Memphis, Tenn., Oct. 6.
Milwaukee & Northern, annual, Milwaukee, Wis., Oct. 7.
Minneapolis & St. Louis, annual, Minneapolis, Minn., Oct. 7.
Northern Pacific, annual, Mills Building, 35 Wall street, New York City, Oct. 16.
Ohio & Mississippi, annual, Central Union Depot, Cincinnati, O., Oct. 9.
Old Colony, annual, Boston, Mass., Sept. 30.
Ottawa, Armprior & Renfrew, annual, Ottawa, Ont., Sept. 30.
St. Louis, Alton & Terre Haute, special, Laclede Building, St. Louis, Mo., Oct. 3, to consider the sale to the Cairo, Vincennes & Chicago.
St. Louis Merchants' Bridge Terminal, special, Laclede Building, St Louis, Mo., Oct. 1, to vote upon a proposed increase of the capital stock.
St. Paul & Duluth, annual, St. Paul, Minn., Oct. 9.
Seaboard & Roanoke, annual, Portsmouth, Va., Oct. 7.
Western Maryland, annual, Baltimore, Md., Oct. 15.
West Virginia Central & Pittsburgh, special, Piedmont, W. Va., Sept. 29.

Railroad and Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Railroad Superintendents* will hold its annual meeting in New York City, Oct. 7.

The *General Time Convention* will hold its next semi annual meeting at the Hotel Brunswick in New York City, Oct. 8.

The *New England Railroad Club* meets at its rooms in the United States Hotel, Beach street, Boston, on the second Wednesday of each month, except June, July and August.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month in the St. Paul Union Station at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of each month at 7:30 p. m. in the directors' room of the St. Paul Union station, except in the months of July and August.

The *American Society of Civil Engineers* holds its regular meetings on thefirst and third Wednesday in each month. at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m , on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular meetings at 8 p.m. on the third Thursday of each month at the Club rooms, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8:00 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the Southwest* holds regular meetings on the second Thursday evening of each month at 8 o'clock, at the Association headquarters, Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The Civil Engineers' Association of Kansas holds regular meetings on the first Wednesday in each month at Wichita, Kan.

American Railway Master Mechanics' Association.

The following committees for the coming year have been appointed on the various topics:

Exhaust Pipes, Nozzles and Steam Passages (to investigate best form and size in proportion to cylinders).—C. F. Thomas, A. W. Gibbs, L. C. Noble, F. C. Smith, John Y. Smith.

Testing Laboratories, Chemical and Mechanical.—George Gibbs, Philip Wallis, G. W. West, L. S. Randolph, D. L. Barnes.

Advantages and Disadvantages of Placing the Fire-box Above the Frames.—Fred. B. Griffiths, James Macbeth, W. A. Foster, A. G. Leonard, Louis F. Lyne.

Relative Value of Steel and Iron Axles.—John Mackenzie, J. S. Graham, John S. Cook, E. B. Wall, Thomas Shaw.

Purification or Softening of Feed Water.—W. T. Small, Harvey Middleton, A. W. Quackenbush, J. B. Barnes, John W. Hill.

The Present Status of the Car Coupler Question (to investigate whether the association can indorse the action of the Master Car Builders' Association from a mechanical standpoint in recommending the vertical plane type of coupler as a standard).—John Hickey, G. W. Rhodes, Sanford Keeler, R. H. Blackall, M. N. Forney.

Examination of Locomotive Engineers and Firemen (on their duties relating to the use of fuel, care of the locomotive and ability to deal with disorder or disability of machinery; to what extent practiced and the best plan for conducting the examination).—W. H. Thomas, John Player, F. D. Casanave, J. W. Luttrell, L. R. Pomeroy.

Operating Locomotives With Different Crews (to investigate the comparative advantages of operating locomotives with different crews on the "first in and first out" plan, and that of confining men to certain engines, the latter not running a greater number of miles than can be rendered by their regular crews; discuss any improvement in the method of running engines).—Ross Kells, W. W. Reynolds, W. F. Turreff, C. G. Turner, John A. Hill.

Locomotive for Heavy Passenger and Fast Freight Train Service (to investigate the types best suited for this service, and the relative economy and safety of eight-wheel, ten-wheel and mogul locomotives for the service in question.)—Pulaski Leeds, James Meehan, E. M. Roberts, C. E. Smart, W. A. Smith.

Electrical Appliances for Railroad Use (to report on the progress of electricity into motive power, car lighting, signaling, welding and kindred uses).—T. W. Gentry, G. B. Hazelhurst, Albert Griggs, John Ortton, F. W. Dean.

Standards of the Association.—Wm. Swanston, Wm. Garstang, C. H. Cory, J. S. McCrum, Thomas Shaw.

Obituary—H. N. Burford.—J. W. Addis, R. H. Briggs, J. C. Ramsey.

Obituary—J. M. Sanborn.—G. W. Stevens, W. L. Gilmore, J. S. Graham.

Obituary—H. M. Britton.—G. H. Hazelton, N. E. Chapman, Reuben Wells.

Disposal of Boston Fund.—J. N. Lauder, J. N. Barr, Angus Sinclair.

To Confer with Committee of Master Car Builders' Association on Bringing Conventions Closer Together.—O. Stewart, Charles Graham, David Clark, G. W. Stevens, John Mackenzie.

On Subjects for Investigation and Discussion.—William H. Lewis, John Wilson, Peter H. Peck.

Executive Committee and Trustees of Boston Fund and Printing Fund.—John Mackenzie, John Hickey, William Garstang, O. Stewart, Angus Sinclair.

Custodian of Boston Fund.—J. H. Setchel.

Chairmen of committees are requested to note the following resolution, adopted at the last Convention: "*Resolved*, That the chairmen of committees be required to send in their reports to the Secretary, not later than May 1; and that the Secretary be instructed to have reports printed and sent to members in time to be read before the Convention meets."

American Society of Railroad Superintendents.

The nineteenth meeting of the society will be held at Hotel Brunswick, Fifth avenue and Twenty-sixth street, New York City, on Tuesday, Oct. 7, 1890, at 10 a. m. The business will include:

Reports of Standing Committees: on Roadway, J. B. Morford, Chairman; on Machinery, G. W. Beach, Chairman; on Transportation, Robert Blee, Chairman.

An address by Mr. H. H. Westinghouse, on Recent Improvements in the Air Brake.

Reading of papers on the following subjects: The Systematic Handling and Distribution of Cars, by W. G. Wattson; on Rail Fastenings and Rails, by James Churchward, C. E. Remarks on Semaphore Signals and Interlocking, by the Secretary.

There will also be a general discussion on the experience of the members with the Standard Code of the General Time Convention. The question of social entertainment of members as a feature of the annual meetings is under consideration by the executive committee.

Master Car and Locomotive Painters' Association.

We gave last week a report of the proceedings of the earlier sessions of the convention of this association. In the session of Sept. 11 the first subject brought up was that of an "Economical Eradicator of Iron Rust." Mr. Quest reported that he had tried several means for cleaning plates affected by iron rust, but with indifferent success. He had had best results from a combination of sulphuric and nitric acid, which, however, is dangerous to handle and injures the iron if not thoroughly cleaned off with alkalies, and so he has fallen back on the old method of scraping and scouring with sandstone. Nobody had anything better to suggest.

A long discussion then took place upon the subject of the "Most Economical Way of Laying Gold Leaf." The almost universal verdict was that it could be most economically used from the book, while in some cases other methods use less leaf, they cost more in time.

A report was then read from A. T. Schroeder, of the Chicago, Milwaukee & St. Paul on the subject of "Tests for Varnishes." At the suggestion of Mr. Barr, Superintendent of Motive Power, more than 200 cars were varnished with 17 different brands of varnishes. Two different kinds of varnish were applied on one side of the car meeting in the middle. Then, by observing the wear of the varnish, several brands were very quickly eliminated, and the one which had given the best results was used as a standard for comparing those which were thought worth further trial. Up to the present the trials have not resulted in the selection of any one brand. After about 10 months of service, a car finished with two brands of varnish, which showed no difference in appearance, was subjected to the oil test. Drops of oil were applied to different points on the surface, and the varnish which absorbed least of the oil was the one selected of those two brands.

It was moved that a committee of 12 be appointed to get up a set of comparative panels; panels to be prepared according to a formula of the secretary, and others according to the formulæ of the members. This motion was carried.

Mr. W. T. Hogan, of the Atchison, Topeka & Santa Fe, submitted samples of his standard instructions for painting rolling stock. He has two sets of instructions, one for cars and one for locomotives, and he thus secures uniformity over the entire system. Blue prints showing the lettering, painting and ornamentation are furnished with the formulæ and instructions for painting.

A petition to Congress to regulate the adulteration of paints, which had been signed by 10 other master painters' associations was adopted.

Washington, D. C., was selected as the next place of meeting.

PERSONAL.

—Chairman J. F. Goddard, of the Western States Passenger Association, refused the proffered chairmanship of the Southwestern Railway and Steamship Association this week.

—Mr. W. H. Knowlton, Chief Engineer of the Duluth & Winnipeg road, has resigned that position and is reported to have been appointed to an office in the engineering department of the Great Northern road on the Pacific Coast extension.

—Mr. T. W. M. Draper, who became connected with the Atlantic & Danville during its construction, has resigned his position of Consulting Engineer of that company and has accepted a similar office with a new company which is to build in Virginia.

—Mr. H. S. Jacoby, Assistant Professor of Civil Engineering at Lehigh University, has been elected Assistant Professor in the College of Civil Engineering in Cornell University, in charge of graphics and bridge engineering. He assumes his duties at Cornell at once.

—Mr. Charles B. Couch, who resigned the Superintendency of the Eastern Division of the Lake Shore & Michigan Southern some months ago, when he was granted leave of absence on account of the poor state of his health, has been appointed Purchasing Agent. Th position has become vacant recently by the death of M L. C. Higgins.

—Mr. Robert Dunbar died at Buffalo, N. Y., Sept. 18, aged 77 years. He was a well-known mechanical engineer, and was owner of the Eagle Iron Works. His inventions and improvements in grain elevators have been very important. He built most of those in Buffalo, also designing elevators at Liverpool and Hull, Eng., and Odessa, Russia, besides many in this country and Canada.

—Mr. William E. Lewis, Assistant Superintendent of the Long Island Railroad and Superintendent of the Long Island Express Co., died in Long Island City Sept. 18. He was ill but a few days. Mr. Lewis had been with the Long Island Co. about two years. He was formerly Superintendent of the Mexican National and for three years from July, 1880, had been Manager of the Cleveland, Youngstown & Pittsburgh.

—Mr. H. C. Boughton, Superintendent of the Pittsburgh & Western road, has resigned to accept a position on the Chesapeake & Ohio. Mr. Boughton was in the employ of the Wabash previous to his connection with the Pittsburgh & Western, when the former road was in the control of Receiver John McNulta, and when the present General Superintendent of the Chesapeake & Ohio was Assistant General Superintendent of the Wabash.

—Mr. Sanford Rankin, a well-known railroad man in the west, died in Chicago this week. He was born in New York in 1817 and went to Chicago in 1854, when he became connected with the United States Express Co. Shortly afterward he entered the employ of the Chicago & Alton Railroad, and was afterward appointed General Eastern Traveling Agent of the Chicago & Northwestern, a place which he held for 16 years. After this he became General Passenger Agent of the Wabash.

—Mr. Elliott Holbrook has been appointed Superintendent of the Pittsburgh Division of the Baltimore & Ohio road. He succeeds Mr. J. V. Patton, who resigned to accept the office of General Manager of the Pittsburgh & Western. Mr. Holbrook has held several prominent railroad positions. Last spring he resigned the position of General Superintendent of the Pittsburgh & Lake Erie road and since Aug. 13 has been acting Chief Engineer of the Staten Island Rapid Transit road.

—Mr. W. W. Dunnavant, Division Passenger Agent of the New York, Lake Erie & Western, at Warren, O., has resigned that position. Mr. Dunnavant has been connected with this company since 1886 as Traveling Passenger Agent, his title being changed but a few weeks ago. He had been previously with the Atlantic & Great Western as Joint Passenger Agent of that road, and the Pittsburgh & Lake Erie at Pittsburgh, for six years. His railroad service began in 1869 as telegraph operator.

—Mr. Horace M. Porter, Press Agent of the Philadelphia & Reading and eldest son of Gen. Horace Porter, Vice President of Pullman's Palace Car Co., died at his home in Philadelphia last week. Shortly after his graduation from Princeton College Mr. Porter entered the service of the Philadelphia & Reading, accepting a position in the office of the General Storekeeper at Reading as a clerk in May, 1883. In November of the same year he went to the office of Superintendent of the Philadelphia and New York division in Philadelphia, where he remained until August of last year. He was then appointed Press Agent, being attached to the general passenger department of the company. This position he filled with much zeal, courtesy and ability.

—Mr. George R. Kaercher, General Counsel of the Philadelphia & Reading, was one of the victims of the accident at Shoemakersville on Sept. 19. He was a passenger in the Pullman car, and his body was found the next morning in 5 ft. of water. Mr. Kaercher was very prominent in the public affairs of Pennsylvania, not only from his position with the railroad company, but also independent of that connection. The many expressions of sorrow received by his family, when his death became known, included messages from President McLeod, many of the bar and judiciary and a number of the most prominent men of the state. Mr. Kaercher was born near Pottsville, Pa., where his family had settled before 1775. He studied law at that place under Franklin B. Gowen and George de B. Keim. He was elected to several political offices, and while District Attorney of Schuylkill County began the prosecution of the "Molly Maguire" conspirators. Some of the most important of these cases were tried in Schuylkill County, and when appealed to the Supreme Courts were argued by Mr. Kaercher. He generally practiced civil law, and in 1883 was given charge of the legal affairs of the Philadelphia & Reading Railroad and Coal and Iron Companies. While in this position he has been prominently identified with all the litigation with other corporations, together with those of the Central of New Jersey. During the receivership of the Reading Companies Mr. Kaercher acted as one of the counsel for the receivers, and, for some time, represented also the railroad company. Upon the reorganization of the companies Mr. Kaercher as general counsel resumed charge of their legal affairs. Latterly he has taken a leading part in advocating the construction of the proposed elevated terminal railroad in Philadelphia.

ELECTIONS AND APPOINTMENTS.

Alabama Midland.—C. P. Atmore, Jr., has been appointed Traveling Passenger Agent of this company, with headquarters at Louisville, Ky.

Atlantic & Danville.—R. M. Stuart Wortley formerly Auditor, who was elected Treasurer a few months ago, has been chosen Vice-President. His office is at Danville, Va.

Baltimore & Ohio.—Elliott Holbrook has been appointed Superintendent of the Pittsburgh Division of the road, with headquarters at Pittsburgh.

Chesapeake & Ohio.—A. J. Haller has been appointed Assistant Master Mechanic of the road, with office at Covington, Ky. T. S. Lloyd has been appointed Master Mechanic of the James River, Richmond and Pennsylvania division, with office at Richmond, Va.

Chicago & Erie.—George A. Coe has been appointed Assistant Superintendent of the Chicago & Erie, and will be placed in charge of the division from Huntingdon to Chicago. Mr. Coe was formerly Chief Dispatcher of the Lake Shore at Toledo. He will enter upon his duties Oct. 1.

Hereafter all communications for the office of the General Superintendent should be addressed to Cleveland, O.

W. J. Holmes has been appointed Superintendent of Telegraph, with headquarters at 21 Cortlandt street, New York City.

M. L. Fouts, for 30 years City Passenger and Ticket Agent at Cleveland, has been given the title of General Agent of the passenger department, with office at Cleveland. His jurisdiction will extend over the greater portion of the New York, Pennsylvania & Ohio and contributing territory, the division passenger agents reporting to him. The following promotions have been made, taking effect Oct. 1: H. W. Forward will be Division Freight Agent of the Eastern Division, with office at Huntington, Ind., and C. L. Thomas will be Division Freight Agent of the Western division, extending from Chicago to North Judson, inclusive, with office at Chicago.

Chicago, Milwaukee & St. Paul.—At the annual meeting held in Milwaukee this week the old directors were re-elected as follows: Roswell Miller and Philip D. Armour, Chicago; Frederick Layton, Milwaukee, and August Belmont, Jr.; Frank S. Bond. Hugh T. Dickey, Peter Geddes, George C. Magoun, Joseph Milbank, William Rockefeller. Samuel Spencer, A. Van Santford and J. Hood Wright. The directors re-elected the present officers.

George W. White, Western Passenger Agent, having resigned, to take effect Sept. 30, W. S. Howell has been appointed Traveling Freight and Passenger Agent, taking effect Oct. 1. His headquarters will be at No. 1501 Farnam Street, Omaha, Neb.

Cleveland & Pittsburgh.—J. J. McCormack, at present Agent at Newburg, O., has been promoted to the position of General Passenger Agent of the River division at Bellaire, O.

Delaware & Lancaster.—The appointment of John O. Keim to the position of Superintendent and Traffic Agent of this new road has been announced. Mr. Keim has been connected with the traffic and operating departments of the Philadelphia & Reading for 19 years. Latterly he has been the City Freight Agent of the company at Sixth and Chestnut streets, Philadelphia.

Delaware & North River.—A meeting of the company was held at No. 10 Wall street, New York City, this week, to elect directors and to consider the consolidation of the road with the Port Jarvis, Monticello & New York Railroad. The following were elected directors: Hugo Rothchilds, P. E. Farnham, Abraham J. Hardenberg, O. P. Howell, Howard H. Morse, Isaac N. Cox, L. E. Schoolmaker, Charles St. John and W. B. Zouse. The officers are: President, Isaac N. Fox, of Ellenville, N. Y.; Vice-President, Peter E. Farnum, of Port Jarvis; Secretary, Charles St. John. The question of consolidation was discussed, but no definite conclusion was reached.

Eastern Minnesota.—Col. W. P. Clough has resigned the Presidency of the road and W. S. Alexander has been elected to succeed him.

Fitchburg.—G. E. Dudley will become Division Freight Agent of the road Oct. 1, C. L. Van Woert having resigned. Mr. Dudley's headquarters will be at Troy, N. Y.

Fort Wayne, Cincinnati & Louisville.—A. G. Young has been appointed Assistant General Freight Agent of the road in place of S. A. Wikel, resigned to accept service with another company.

Gainesville, Jefferson & Southern.—The annual meeting of the stockholders of the company made no change in the Board of Directors, except that the vacancies caused by the deaths of K. L. Boone and D. R. Lyle were filled by the election of John A. Smith and H. D. McDaniel.

Great Northern.—S. E. Dana, General Baggage Agent of the St. Paul, Minneapolis & Manitoba, has been appointed General Baggage Agent of the Montana Central and Eastern Minnesota roads. His title will now be General Baggage Agent of the Great Northern Railway Line.

Harmon, Parsons & Rowlesburgh.—The names and addresses of the incorporators of this company, referred to last week, are as follows: James Goodfellow, William H. Smith and Julius B. Price, Jr., of Philadelphia, Pa.; Charles H. Barritt, County of Philadelphia, Pa.; Chas. G. Mayhew, Wayne, Pa.

Kansas City, Fort Scott & Memphis.—A. S. Blodgett has been appointed General Roadmaster of the Kansas City, Memphis & Birmingham, with office at Memphis, Tenn., to succeed J. E. Beck, who has resigned to accept a position with the Panama road.

Lake Shore & Michigan Southern.—Charles B. Couch has been appointed Purchasing Agent of this company, in place of L. C. Higgins, deceased. His office will be at Cleveland, O.

Louisville & Nashville.—H. F. Smith has been appointed Superintendent of the terminals of the Louisville, Cincinnati & Lexington division of the Louisville & Nashville at Louisville, Ky. He will also have charge of the Louisville division and points near Louisville.

Louisville, New Orleans & Texas.—T. J. Ansley, former Roadmaster of the Mobile & Montgomery, and recently with the Alabama Midland, has been appointed Roadmaster of this road.

Louisville, St. Louis & Texas.—J. K. McCracken has been appointed General Manager of the company. The heads of the various departments of the service will report to him and be governed by his orders and directions. His office will be at 251 Fourth avenue, Louisville, Ky.

S. A. Wikel has been appointed General Freight and Passenger Agent, in place of J. K. McCracken, promoted.

Minneapolis, St. Paul & Sault Ste. Marie.—The annual meeting of the road was held in Minneapolis, last week. The old directors and officers were re-elected. President, F. N. Finney; Vice-President, R. B. Langdon; Secretary and Treasurer, W. S. Larkin; Board of Directors: W. D. Washburn, Thomas Lowry, R. B. Langdon, John Martin, J. S. Pillsbury, F. N. Finney, and W. C. Vanhorne.

The annual meeting of this road was held in Minneapolis Sept. 10. The old directors and officers were re-elected. President, F. N. Finney; Vice-President, R. B. Langdon; Secretary and Treasurer, W. S. Martin. Board of Directors, W. D. Washburn, Thomas Lowry, R. B. Langdon, John Martin, J. S. Pillsbury, F. N. Finney and W. C. Van Horne.

C. H. Hibbard has been appointed General Passenger Agent, assuming his duties Sept. 15. His office will be at Minneapolis, Minn. Mr. Hibbard also holds a similar position on the Duluth South Shore & Atlantic.

Nashville, Chattanooga & St. Louis.—W. F. March has been appointed Assistant General Passenger and Ticket Agent of this road.

Penobscot Shore Line.—The following officers have been elected by this company, the successor of the Knox & Lincoln: Arthur Sewall, President, Bath, Me.; Payson Tucker, General Manager, Portland, Me.; F. H. Low, Treasurer, Bath, and W. L. White, Superintendent, Bath.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The following officers were elected at a meeting in Philadelphia, Sept. 18: George B. Roberts, President, Philadelphia; J. N. McCullough, First Vice-President; James McCrea, Second Vice-President; Thomas D. Messler, Third Vice-President and Controller; John F. Davidson. Treasurer; S. B. Leggett, Secretary, all of Pittsburgh; Stephen W. White, Assistant Secretary, Philadelphia; Joseph Wood, General Manager, Pittsburgh, E. B. Taylor, General Superintendent of Transportation, Pittsburgh; John F. Miller, General Superintendent, Columbus, O.

Port Townsend & Southern.—C. C. Jacobs has been made Assistant Superintendent of the Olympia & Tenino branch, with headquarters at Olympia, Wash.

Rondout Valley.—Isaac H. Cox, Walter S. Cox, John P. Cox, George B. Childs, W. S. Doyle, Theodore Wilklow, John G. Du Bois and George Young, of Ellenville, N. Y.; Laville Wilkinson, of Kerhonkson; John H. Drake and W. D. Shatton, of Middletown; John C. Hoornbeck, of Wawarsing, and H. F. Jones, of Brooklyn, N. Y., are the directors of this company whose incorporation was recently noted.

St. Louis, Alton & Springfield.—W. W. Arnold has been appointed Superintendent of the road, vice M. T. Seymour, resigned.

St. Paul, Minneapolis & Manitoba.—At the annual meeting of this company, held Sept. 11, at St. Paul, Minn., James J. Hill, Sir George Stephen, Sir Donald A. Smith, George Bliss, Samuel P. Hill, W. P. Clough and M. D. Grover were elected directors.

West Shore.—The office of J. P. Bradfield, Superintendent of the Hudson River Division of the road, and the dispacher's office, have been removed from Kingston to Weehawken, N. J.

Winona & Southwestern.—E. J. Hornbrooke has been appointed General Passenger Agent, with headquarters at Winona, Minn., his title being General Freight and Passenger Agent.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Aberdeen & Pierre.—Grading on this line, between Aberdeen and Pierre, S. D., has been begun, and it is expected to have some of the track laid this season. The line will be about 100 miles long.

Thirty grading contracts have been let on this line, and active operations were begun last Monday.

Alabama Mineral.—John Sullivan, who had the contract for building the first 10 miles of the 33-mile extension from Sylacauga to Calera, Ala., has completed his contract and removed his outfit to Troy.

Albany, Florida & Northern.—The Chief Engineer advertises that the contract for the tracklaying and surfacing on the 35 miles of this road between Albany and Cordele, Ga., will be let at once at Cordele.

Baltimore Belt.—The Belt Company has recorded a first mortgage to the Mercantile Trust & Deposit Co., covering an issue of $6,000,000 bonds bearing five per cent. interest. The mortgage covers the entire line of the road. The Baltimore & Ohio has a contract for the use of the Belt lines, and in part return for this indorses the bonds and agrees to make up all deficiency in the net earnings of the line.

Canadian Pacific.—The grading of the roadbed for the extension of the Glenboro Branch from its present terminal point to Souris City, Man., having been completed, a large gang of men have commenced the work of tracklaying. It is expected that the line will be ready for train service in two or three weeks. Engineers are surveying a connecting link between the company's yards at Ingersoll and the West Ontario Branch, six miles west of Thamesford, Ont. It is said that the company intends to abandon the line between Thamesford and Woodstock for through traffic on account of the heavy grade west of Woodstock. The company will soon erect a large brick station at Ingersoll which will be completed this fall.

Carolina, Knoxville & Western.—J. G. Gibbs, of Columbia, S. C., has just completed a preliminary survey between Greenwood and Johnston, S. C., a distance of about 35 miles. The survey was made for a committee of the citizens of Greenwood, who have requested the officers of this company to adopt the route just surveyed. The road is graded between Ninety-Six and Johnson as a narrow gauge line. The Greenwood people desire that the line be built from Greenville to Greenwood, and thence to Johnston, and had this survey made. The proposed line touches the old grade about 12 miles from Greenwood.

Carolina Southern.—The company has secured the entire right of way from Cheraw to Sumter, S. C., and the solicitor of the road is now negotiating for the rights of way through Sumter. The surveys were made in April and May. The length of the road will be about 65 miles.

Chicago, Milwaukee & St. Paul.—The company has made a proposition to the city authorities of Minneapolis to abolish grade crossings on its Hastings & Dakota division within the city limits. The grade of the road will be raised from 6 to 8 ft., and the streets lowered enough to allow travel under the tracks. The company agrees to build bridges over streets constructed before the road was built, but asks the city to build over all that have been opened since. This makes 18 bridges for the company to build and 23 for the city. The total cost is estimated at $72,000 for the road and $92,000 for the city.

Cleveland Belt.—Most of the surveying for this belt road at Cleveland, O., which is to be built by the Cleveland & Canton, has been finished. One engineering corps, however, is still engaged on the surveys. The right of way has been secured from near Houston street, where the line will leave the Cleveland & Canton to the Cleveland, Cincinnati, Chicago & St. Louis tracks in the southwestern part of the city, and some work of construction has already been done. It will be prosecuted until the Lake Shore & Michigan Southern tracks are reached to the west, probably next spring, when the eastern branch of the belt line will be undertaken.

Cleveland, Cincinnati, Chicago & St. Louis.—The engineers who have been surveying the new branches of this company in eastern Indiana to connect the White Water division with other parts of the system have finished the preliminary surveys for the line from Brookville through Liberty and Richmond to Union City. It is a very direct line. The distance between the two points is 58 miles. The steepest grade will not exceed 40 ft. to the mile, and the curves will not exceed four degrees.

Croton Valley.—A meeting of the stockholders was recently held at the office, No. 48 Wall street, New York City, at which steps were taken toward the issuing of bonds to pay for the construction of the road. Contracts have already been let and the work of building the road will begin in a very short time. The road is to extend from Croton Landing, opposite Haverstraw, N. Y., through the county of Westchester to the state line, a distance of about 23 miles.

Denver & Rio Grande.—The tracklaying on the narrow gauge branch from Villa Grove, Col., south through the San Luis Valley has been completed for a distance of 30 miles to Moffat, a new town. About 25 miles of the line yet remains to be finished to reach Alamosa, the southern terminus, 55 miles from Villa Grove. It is expected to have the line ready for operation by Oct. 1.

Drummond County.—Grading has been about finished on the extension from Drummondville southeast to Ste. Rosalie, P. Que., near St. Hyacinthe, a distance of over 26 miles. This extension is built to make a connection with the Grand Trunk and Canadian Pacific road, which is effected at Ste. Rosalie. The tracklaying was begun recently and about six miles of this work has been done up to the present time. The company is laying about three-quarters of a mile of track a day. It is doing the work with its own forces, and no contracts have been let either for grading or tracklaying.

There are only three small bridges on this section. The first one over the Black River is erected, being of steel and 55 ft. long; the other two bridges will be smaller. It is expected that the section will be completed and open for traffic this autumn. The grading is all earthwork, with maximum grades of 1 ft. per 100 ft. and curves of one degree. About 300 men are working on the extension. The road is now being operated between Drummondville and Balls Wharf, on the St. Lawrence River, 36 miles. Of this distance 23 miles was built from the end of the first 12½ miles constructed previously, commencing at Mitchell Station, and thence to the terminus of the road at Balls Wharf, crossing the northeastern and southwestern branches of the Nicolet River, over both of which steel bridges are built. The bridge over the southwestern branch is a single span of 200 ft., and the northeastern branch bridge is a truss and girder, 712 ft. long, on piers and pedestals 79 ft. above water level.

Duluth, Crookston & Northern.—A first mortgage has been filed with the Secretary of State of Minnesota by this company to the Farmers' Loan & Trust Co. of New York. The bonds issued on the security of the mortgage are to be at a rate note not exceeding $20,000 per mile of road constructed.

Duluth, Red Lake Falls & Northern.—Surveyors have started out on this line (formerly the Duluth, Northwestern & Winnipeg) and will run a line from Red Lake Falls to Warren, Minn., thence across the Red River to St. Thomas, N. D. From Red Lake Falls the road will extend southeast, making nearly an air line to Wright, on the Northern Pacific, from which place the company will use the Northern Pacific tracks into Duluth.

Forest City & Sioux City.—Contracts will probably be let at once for the extension of this line from Gettysburg southeast toward Huron, S. D., and the grading will be completed this season. The line now being operated is between Gettysburg and Forest City, a distance of 16 miles. The extension to Huron will be over 100 miles long.

Fort Plain & Richfield Springs.—At a citizens' meeting held in Fort Plain, N. Y., last week, $10,000 was subscribed for the purchase of the right of way through the town of Minden for this road. The right of way has now been bought between those points, and it is expected that the road will be in operation by July, 1891. It will be 23 miles long.

Fremont, Elkhorn & Missouri Valley.—The branch to Hot Springs, S. D., from Buffalo Gap westerly about 12 miles, was opened for traffic Sept. 9. The extension of the branch from Whitewood to Deadwood, S. D., along the Whitewood Creek valley, five or six miles, will be opened Oct. 15.

Georgia, Tennessee & Illinois.—The company has filed a charter in Alabama for the proposed division of its road in that state, which will probably extend from Tallapoosa, Ga., southerly to Wedowee, Ala., a distance of 35 miles. The road was chartered in Georgia last year to extend from Tallapoosa to Chattanooga, Tenn., and during the past summer preliminary surveys have been made on this route.

Grand Trunk.—The operation of the second track has been extended to Gananoque, Ont., 159 miles from Montreal. The company now has a continuous double track road between these points, and before the close of the year the second track will be ready for use for many miles west of Gananoque. The second track will be finished to Belleville, 220 miles from Montreal, next spring. Work is at present in progress at Kingston Mills. The double track work east and west of Kingston

is very heavy, but is being pushed rapidly. A trestle bridge has been built alongside the iron bridge for working trains, and another bridge will be built this winter on the other side to carry the regular traffic while the old iron bridge is being removed. The new bridge will be a covered iron one, with a track lower than the present one, but without bringing the structure nearer to the locks. One of the massive stone centre piers has been removed, and a wider one with a more solid bottom will be built. A new city branch line will be built next year, giving a quick and easy run into Kingston, and avoiding the shunting now necessary up the main line.

Houston, Central Arkansas & Northern.—The contractors, Henry, Forrest & Co., of St. Louis, have begun work at Alexandria, La., with about 150 teams. A much larger number will soon be working north from that point to meet the force building south from Riverton, La., the present southern terminus. The work has been in progress from Riverton for several weeks. The grading at Alexandria was begun at the Texas & Pacific tracks and will be continued to the Red River, which is to be crossed by a large bridge.

Huron & Ontario.—At a meeting of the directors of the company held last week, an arrangement was made and a contract drawn up by which the charter of the road is to be transferred to M. G. Cameron, of Toronto, Ont., on behalf of a company represented by him, on condition that arrangements for the construction of the road be made to the satisfaction of the present directors within six months.

Interoceanic.—Delfin Sanchez & Co., the contractors in chief, have received a report from H. H. Filley, the Chief Engineer of Sullivan & Hampson, the sub-contractors for the work between Jalapa and Vera Cruz, stating that a through train will probably be run to Vera Cruz by Jan. 1 next, if they can keep the present force of men at work; but the completion of the line will not be delayed more than a month after the promised date. The little grading that remains to be done will be completed in two months. No tracklaying has been done at the Jalapa end of the line as yet, as the heaviest work in cuts and fillings has been encountered there, and some of this work is still unconpleted. Rails and ties for 15 kilometres of track are ready at Jalapa, and tracklaying will be pushed from that place. Sixty-five kilometres of track are laid at the Vera Cruz end. Passenger traffic, which was temporarily interrupted between Perote and Jalapa, has been resumed, and trains are now running daily between the City of Mexico and that point.

Kansas City, Watkins & Gulf.—Seventy miles of this road have been graded from Lake Charles, La., northeasterly toward Alexandria, by the contractors Kennedy & Stone, of Topeka, Kan. Their present headquarters are at Lake Charles. They have been engaged on the work since the latter part of June, 1889. About 40 miles have been finished since last January. There are 200 men now at work. The track has been laid for 10 miles. The maximum grade is less than one-half of one per cent., and the maximum curvature is one degree. The grading becomes heavier toward the north. The line has been located to Alexandria, and the preliminary survey is now being made north of the Red River, and has been finished for 50 miles. Additional contracts may soon be let for the division north of Alexandria.

Little Falls, Mille Lacs & Superior.—Right of way agents are working to secure the right of way of this road from Little Falls, Minn., to Superior, Wis. The line will extend through the Mille Lacs reservation, and will be about 120 miles long. The Northern Pacific has a line between these points but little longer than this.

Louisville, New Orleans & Texas.—The company is now operating its Helena extension to Helena, Ark. All the new road has been completed for some time, but the extension could not be opened for traffic until the inclines on each bank of the Mississippi River were finished. This has only just been done. The entire train is transferred across the river by a steamer.

Macon & Atlantic.—The men now at work on this road east of Dublin, Ga., number between 700 and 800. The largest part of this force is employed at a point 10 miles east of Stillmore, grading westwardly in the direction of Wrightsville. This brings the work of construction within 30 miles of the Ogeechee River, and the permanent line has been located as far east as the Ogeechee River. The engineers in charge of this division have changed their headquarters from the west side of the river to the neighborhood of Guyton, where it is expected the corps will be encamped for the remainder of the month, during which time the line will be located from the Ogeechee River, via Guyton, to Savannah.

Marietta & North Georgia.—The Knoxville, Tenn., city council has unanimously passed an ordinance to issue city bonds for $275,000 in favor of the Knoxville Southern road, recently completed, and to take the company's stock at par value for the same.

Mexican Continental.—A deposit of $50,000 forfeit money, as required by the San Roman concession, for five lines of railroads from the Rio Grande River to the Guatemalan border, has been made in the National Bank, at the City of Mexico. The deposit is in bonds of the public debt.

Mexican National.—The work of laying a third rail on the Texas Mexican road from Laredo to Alice Junction, 60 miles west of Corpus Christi, Tex., will be begun, it is reported, in a month. This will enable the trains on the San Antonio & Aransas Pass road to run over the Texas Mexican road into the yards of the Mexican National at Laredo.

Millen & Southern.—The directors of the company have just placed on record at Atlanta, Ga., as provided by law, resolutions adopted last May, authorizing the construction of three extensions of the road. The extensions are from Millen, on the northeast, through the counties of Screven and Burke to the Savannah River, 35 miles long; also from Sterling or some other point in Montgomery County, on the line of the Savannah, Americus & Montgomery, through the counties of Montgomery, Tatnall, Appling, Ware, and, if found practicable, through Pierce and Clinch counties. This branch is to be 130 miles long. Also from some point in Appling, Ware or Pierce County, through Pierce, Wayne and Glynn counties to Brunswick or its vicinity. This extension is to be 65 miles long.

New Orleans & Northwestern.—The line from Vidalia, La., on the Mississippi River, opposite Natchez, Miss., northwesterly to Rayville, a distance of about 74 miles, has been opened for regular business, and freight and passenger trains are now running over this division of the road. The line has been located to Bastrop, 22 miles from Rayville, and grading has been in progress northwest from the latter town for some time.

New Roads.—The citizens of Monroe, La., are securing right of way for a proposed road from that town to Farmerville, a distance of about 30 miles.

T. W. M. Draper, of Norfolk, Va., is Chief Engineer of a proposed road from Norfolk through southwest Virginia and toward Bristol.

At an election held in Greene County and at Greenville, Tenn., on Sept. 20, it was voted that the sum of $100,000 be subscribed by the county and $25,000 by the town for a proposed railroad from Paint Rock, on the East Tennessee, Virginia & Georgia, northerly through Greenville to Kingsport, near the Kentucky state line west of Bristol. Before this election $100,000 had been voted in aid of the enterprise.

A local railroad committee at Henrietta, Tex., is negotiating with a contractor to undertake the construction of a road from Henrietta northerly to the Red River and through the Indian Territory to Trenton or near there to a connection with the survey made by the Chicago, Rock Island & Pacific for an extension of its branch which now reaches Minco. It is expected that the new road will be purchased by the Rock Island, when it extends to the Red River.

Norfolk, Va.—The Common Council has granted power to the Norfolk Co. to build its proposed bridge across Smith's Creek on Botetourt street. A resolution was adopted instructing the city engineer to apply to the Board of Harbor Commissioners for permission to construct the bridge across Smith's Creek.

Ottawa & Parry Sound.—The survey of this road has been started on the line between Ottawa and Arnprior. The road from Parry Sound northeasterly to Emsdale, Ont., and from Renfrew to Barries Bay has already been located. About 100 miles remain to be surveyed.

Pittsburgh, Shanango & Lake Erie.—A construction force was put at work last week at Osgood, near Greenville, Pa., on the extension of this road to Conneaut Harbor, on Lake Erie, a distance of about 60 miles. Most of the distance has been graded. It is stated that most of the tracklaying will be done before the close of the year.

Port Arthur, Duluth & Western.—Construction work is being pushed rapidly. The contractor has a force erecting the small bridges and culverts west of the Kaministiquia River. The fencing for the first 20 miles is about complete; the roadbed is ready for the rails for this distance. It will be opened to Silver Mountain before November.

St. Louis.—The company has filed articles of organization in Wisconsin to build a line from a point on the St. Louis River opposite Fond du Lac, Minn., to the town of Walbridge, Douglas County, where it will connect with the Northern Pacific. The length of the road in Wisconsin will be three miles. The capital stock is $50,000, and the incorporators are Charles H. Clague, N. Stephenson, John D. Stryker and A. C. Otis, of Duluth, and Horace H. Walmsley, of Eau Claire, Wis.

Savannah, Americus & Montgomery.—The second preliminary survey for the Montgomery survey has been finished from Huntsboro to Montgomery, Ala. The locating survey has been made to Huntsboro, and grading is progressing rapidly between that point and the Chattahoochie River, having already been finished on the east side of the river from Louvale, the western terminus of the road. On about 10 miles of the distance between the Chattahoochie River and Huntsboro the grading has been completed. One party of engineers is surveying the line in the city limits at Montgomery, and for the station and grounds, and another corps is surveying west from Huntsboro on the location of the extension.

South Bound.—The engineers are now engaged on the preliminary survey between Columbia and Blackville, S. C. This survey will will be finished in a few days. Two preliminary lines have been run to Columbia and one to Barnwell. One hundred tons of rails recently received will be shipped to the graded portion of the right of way this week, and tracklaying commenced at the crossing of the Central of Georgia. The two locomotives to be used in the work of construction are expected to arrive this week, and the cars for that service will arrive on Oct. 1.

Sumpter Valley.—The company has been incorporated in Washington to build a road from Baker City to Sumpter Valley, Baker county, Or. The principal office will be at Baker City. The capital stock is $50,000, and the incorporators, John Stoddard, C. W. Nibley, David Eccles, T. D. Dee and J. C. West.

Wadena & Park Rapids.—Contracts have been let for the grading of this road: the 15 miles north of Wadena, Minn., to Vokelburg & Co., of Minneapolis, and the 20 miles south from Park Rapids, the northern terminus of the road, to David Swank, of St. Paul. About 2,000 men will be employed, and the track is to be laid this fall.

Weatherford, Mineral Wells & Northwestern.—The grading has been nearly finished from Weatherford northwest about 15 miles to the coal mines owned by the company. All the grading on this section will be ready for tracklaying in two weeks. The company is putting down cross ties and will commence laying track the latter part of this week. Most of the material for this work has arrived at Weatherford. The road will be ready for operation to the coal mines by Oct. 15, and perhaps also to Mineral Wells about the same date. The company will not build into Weatherford at once, but will enter the town over the tracks of the Texas & Pacific from its connection with that line 2½ miles west of the city.

West Virginia Central.—The reorganization of this company, which has been in progress for some time, has been completed this year, and its new President, Alexander Boudrou, 1727 North Tenth street, Philadelphia, is negotiating for the capital needed to complete the work. He states that he has an offer of the amount of money required, and wishes to find a chief engineer with proper qualifications. This line was surveyed and some work done in 1874 on a route from Ceredo, Wayne County, West Va., through Charleston, West Va., and Harrisburg, Va., to Acquia Creek, about 250 miles. Nearly the entire route is through a valuable coal and mineral land, much of which is undeveloped. This company should not be confused with the West Virginia Central & Pittsburgh, from Cumberland to Elkins, which is commonly known as the West Virginia Central.

Wheeling & Lake Erie.—The completion of the extensions now under construction will be accomplished during the year—that to Steubenville, O., by Oct. 10, Wheeling about Nov. 15, and Bellaire, where a connection will be made with the Baltimore & Ohio, by Dec. 15. The terminals at Lake Erie are being placed in condition to handle the increased quantities of ore which the company is assured of transporting as soon as its Steubenville extension is opened.

Winona & Southwestern.—A telegraph line has been completed along this road from Winona to Utica. Contracts have been let for building brick and stone stations at Utica and St. Charles, Minn., the latter costing $25,000. The tracklayers have reached Dover, 11 miles from Utica.

Wisconsin Midland.—Miller & Loomis, of Chicago, who have the contract for the work now in progress on this road near Fond du Lac, Wis., have completed about three miles of grading. Their contract is for 75 miles.

York & Black Mount.—A charter was granted in Pennsylvania last week to the company to build a road two miles in length from or near the southern limits of the city of York to the top of what is commonly known as Webb's Hill. The capital is $50,000.

GENERAL RAILROAD NEWS.

Chicago, Milwaukee & St. Paul.—At the annual meeting of the road in Milwaukee, Sept. 21, the stockholders voted unanimously to purchase the Milwaukee & Northern road, and will take possession Oct. 1. The road has been doing a prosperous business the last year and has increased its freight business nearly 35 per cent. in the last six months. The earnings for the year ending June 30 were $1,426,941, against $1,131,442 for 1889; a net increase of $295,499. It extends through a good mining and timber country, and its acquisition is regarded as of great value. The official announcement was made as follows: "The stockholders unanimously voted to authorize the purchase of the stock of the Milwaukee & Northern and its proprietary lines, embracing 362 miles, the price to be paid being one share of Chicago, Milwaukee & St. Paul common stock for one share of Milwaukee & Northern stock, the property being subject to a mortgage of $17,000 per mile of six per cent. bonds. The issue of 61,533 shares of common stock to pay for a like number of shares of stock of the Milwaukee & Northern and its proprietary lines, was authorized."

Cincinnati, Saginaw & Mackinaw.—We are informed that no sale of this property to the Grand Trunk has been made as has been generally reported. These reports originated from a tour of inspection made recently by Sir Henry Tyler and Sir Joseph Hickson, the object of which was to learn the road's resources and amount of business it was furnishing the Grand Trunk, and also to investigate the traffic possibilities of the Saginaw Valley. There is small likelihood of any sale being consummated.

Cleveland, Cincinnati, Chicago & St. Louis.—At the annual meeting of the stockholders in Cincinnati on Oct. 29, several important propositions will be voted on. Among these is the proposal that the Columbus, Springfield & Cincinnati be acquired by purchase or by lease, and for this purpose consent will be asked to the issue of $500,000 more stock at par, and to the issue of $1,000,000 of four per cent. bonds covering the property to be acquired. The purchase or lease of the Cincinnati, Sandusky & Cleveland road and the issue for that purpose of $3,212,680 new stock will also be considered.

Fitchburg.—The directors have published the following report for the nine months ending June 30: Earnings from all sources, $4,601,058; operating expenses, $3,286,976; leaving a net income of $1,314,082. In this period 4,605 tons of 76 lb. rails were laid and 191,335 ties were used in repairs. Twelve new locomotives were added to the equipment. The car shops at Fitchburg have been completed at a cost of $210,121. A new roundhouse, with accommodations for 40 locomotives, is being erected at Charlestown.

Illinois Central.—The fiscal year was changed in 1889 from Dec. 30 to June 30, and the report just issued is the first full report for that year. The gross earnings were $16,452,022 on 2,875 miles of road. This sum includes the gross earnings of the Dubuque & Sioux City road, $1,909,924, and also of the Cedar Falls & Minnesota, $94,092. The gross earnings in 1889 were $14,655,617 on 2,714 miles of road. The increase, $1,796,405, is 10.9 per cent. The net earnings of the road, exclusive of the lines operated by and for the Dubuque & Sioux City, for 1889 were $4,882,901, and for the preceding year, $4,831,140. That the large increase in gross revenue has not been followed by an equal increase in net earnings is due (1) to the expenditure for maintenance of way and structures of $2,110,777, an increase of $651,870 over the amount spent for that purpose during the previous year. A large portion of this was due to the laying of 24,000 tons of steel rails, of which 20,000 tons were of the new 75 lb. standard. The average amount of steel rails charged maintenance of way during each of the last ten to years has been 7,988 tons. (2) To the floods in the lower Mississippi Valley, which submerged 20 miles of the track near New Orleans for 72 days. During the overflow passenger and freight trains were sent over other lines via Meridian, Miss., to Jackson, Miss., a local service being at the same time maintained on that portion of the road south of Jackson which was not affected. Apart from the loss of business and claims for damages by reason of detention, there was paid to other companies for transportation of freight and passengers, $143,857. (3) To the loss from the strike on the lines in Illinois, which occurred when the fruit and perishable merchandise traffic was at its height. During the year there have been sold Illinois Central four per cent. gold bonds of 1952 to the amount of $1,734,000. Of these bonds there remain unsold $3,255,000, of which there have been set apart for surplus dividend fund $211,000, and to the insurance fund $109,000. The case against the Cedar Falls & Minnesota has been heard by the Circuit Court of the United States, but no decision has as yet been handed down. The sum thus far paid into courts amounts, without interest, to $319,818. For advances heretofore made by the company to the Dubuque & Sioux City there have been received during the past year $211,000 of the five per cent. bonds of that company, part of an issue of $3,000,000 secured by a mortgage on the original 143 miles of that road. The mortgage provides for the redemption of all the outstanding seven per cent. bonds of that company at their maturity, July 1, 1894, after which date the five per cent. bonds will be the first lien upon the railroad. Of these, $1,295,000 have been issued, and are now in the treasury

of the Illinois Central, and the interest on them is earned and paid regularly. If the stockholders authorize the increase of the capital stock from $40,000,000 to $45,000,000, the funds so obtained will be used in building passenger stations and in enlarging and rearranging the yards at Chicago, New Orleans, Memphis and other points, extending the second track, expediting the ballasting, reducing grades, the purchase of additional equipment in raising the track near New Orleans, and other betterments to permanent way. The directors believe that competition among Western railroads, which has heretofore been almost entirely on the line of a reduction of rates, is coming to be, as in Great Britain and the Eastern States, one of adequacy and frequency of service. During the past year the company was obliged to pay several thousand dollars for the rent of locomotives borrowed from another railway, and as mileage for the use of freight cars of other companies upon this road there was paid $137,771 in excess of the sum received from other companies for their use of Illinois Central cars. It is estimated that the rates of mileage are equivalent to an interest of about 10 per cent. upon the cost of freight cars. With a supply of cars sufficient to allow them to be used freely on other railroads, a sum far in excess of 10 per cent. upon their cost would have been received in traffic over the road in consequence of the business brought from foreign roads in such cars.

Missouri, Kansas & Texas.—In the District Court at Austin, Tex., last Saturday, the case of the State vs. this Company for forfeiture of its charter was, on motion of the defendant, transferred to the United States Court, the State Court having no jurisdiction.

Montreal, Portland & Boston.—The suit of this railroad to recover possession of its road from the Canadian Pacific was begun in the Superior Court at Montreal last week. Plaintiffs claim that the arrangement by which the Canadian Pacific obtained possession of the road was illegal. American bondholders, who are said to hold $500,000 of the bonds, are pressing the suit. Mr. Van Horne was examined in the case, and on being asked whether the Canadian Pacific controls the Montreal, Portland & Boston and Southeastern roads, said that it does not directly control the roads—that it is operating them for the trustees. The trustees, however, represent an interest in which the Canadian Pacific predominates. The suit represents $1,800,000. Mr. Van Horne admitted that the Canadian Pacific held a majority of the bonds of the Southeastern Railroad to the extent of $1,300,000 and $100,000 of the Montreal, Portland & Boston.

New York, New Haven & Hartford.—The report to the Massachusetts Railroad Commissioners for the year ending June 30, 1890, gives the gross earnings as $10,749,167; operating expenses, $7,379,774; income from operations, $3,369,393. Total income, $3,588,414. Total deduction from income, $1,685,394; net income, $1,903,019, less 10 per cent. dividend of $1,705,000; surplus of year, $198,019. Total surplus June 30, 1890, $3,706,527. Total passengers carried were 13,148,140; average rate per passenger per mile, 1.66 cents. Number of tons of freight carried, 3,563,873; average rate per ton per mile, 1.26 cents. Passenger earnings per mile of road, $10,624; freight, $8,844. Miles of road operated, 508. Number of passengers injured, 30; number of employés killed, 24; number of employés injured, 311; other people killed, 86; injured, 207.

The report of the Directors says that 25 miles of second track upon the Shore Line Division between Madison and Lyme, Conn., have been completed. The work is still in progress between East Lyme and New London, seven miles, and between Madison and Leete's Landing, seven miles, but neither section will be completed before Jan. 1. This will leave the single track only between Leete's Landing and Fair Haven. East of South Norwalk, upon the New York Division, work has continued upon the four tracks. All grade crossings are to be eliminated, and it is hoped that on Jan. 1 not one will remain between South Norwalk and the west line of Bridgeport. In the latter city a large expenditure will be necessary. The company owns a complete right of way through Bridgeport, but there are 28 grade crossings, and a suitable passenger station must be provided. Plans are being prepared to meet these wants. Agreements have been entered into with the New York Central (lessee of the Harlem) Railroad to change the method of connection near Woodlawn so as to do away with the crossing of either track by the trains of either road, and a considerable expenditure will be made for this purpose during the current year. There remain within the limits of New Haven 20 grade crossings upon the Northampton and Shore Line Divisions, all of which should be eliminated. During the nine months ending June 30, 1890, as compared with the same nine months of the preceding year the gross income of the company's property has increased $592,275 as follows: Passenger receipts, $176,902; freight receipts, $378,428; miscellaneous, $36,935. Commenting on this increase the report says: "At the low rate at which traffic is now moved, these continually increasing earnings represent an enormous volume of business, and under necessary continued expenditures for motive power, rolling stock and floating equipments. The company is now constructing under contract 50 passenger coaches, 10 standard locomotives, 3 tug boats and 4 car floats." During the nine months ending June 30 last the total income of the road was $8,019 010; total operating expenses $5,333,252, and the net earnings applicable to dividends $1,391,630.

Northern Pacific.—The company having acquired the Spokane division of the Seattle, Lake Shore & Eastern, that line will hereafter be operated as the Spokane branch of the Idaho division, under the jurisdiction of the officers of the Northern Pacific.

Pennsylvania.—The following is the statement of the business of all lines of the company: All lines east of Pittsburgh and Erie for August, 1890, as compared with the same month in 1889, show a decrease in gross earnings of $63,109; an increase in expenses of $277,339; a decrease in net earnings of $340,448. The eight months of 1890, as compared with the same period of 1889, show an increase in gross earnings of $4,023,958; an increase in expenses of $4,298,818; a decrease in net earnings of $274,860. All lines west of Pittsburgh and Erie for August, 1890, as compared with the same month in 1889, show an increase in gross earnings of $241,925; an increase in expenses of $264,743; a decrease in net earnings of $22,818. The eight months of 1890, as compared with the same period of 1889, show an increase in gross earnings of $3,570,083; an increase in expenses of $2,490,310; an increase in net earnings of $1,079,773.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The directors of the company completed the arrangements for the transfer of the four roads which have been merged under this name, and other matters relating to the organization of the company at a meeting in Philadelphia last week. The transfer will probably be made on Oct. 1, and after that date the operation of the lines will be by the consolidated company. The Pittsburgh, Cincinnati & St. Louis; the Chicago, St. Louis & Pittsburgh; the Jeffersonville, Madison & Indianapolis, and the Cincinnati & Richmond companies are included in the merger. The designation Pennsylvania Lines west of Pittsburgh will probably be used by the company in referring to the lines, and this name will appear on letter heads and the property of the company, instead of the official title.

St. Paul & Duluth.—The statement for the year to June 30, gives the following figures: Gross earnings, $1,410,527, an increase of $3,661; operating expenses and taxes, $1,017,459; decrease, $34,934; net earnings, $393,068; increase, $38,595; other income, decrease, $47,707; total, $393,068; decrease, $9,112; fixed charges, $232,000; increase, $13,190; surplus, $161,066; decrease, $22,302.

This company will soon commence the erection of a freight house 60 ft. long at Duluth. A new passenger station will also be built at the corner of Grand and Argyle avenues, at Duluth.—The terminals of this road will soon be materially changed, on account of the large increase in business.—The Duluth & Winnipeg has ceased running trains over the St. Paul & Duluth tracks from Cloquet to Duluth, owing to a disagreement about terms.

Salisbury & Harvey.—The dispute as to the ownership of this railroad was settled last week in the Equity Court, St. Johns, N. B. Two parties claim to have purchased the line from English bondholders. The decision was in favor of the National Improvement Company of New York, who are to pay over $2,000 to the other party to reimburse them for expenses.

Shenandoah Valley.—It is announced by the Purchasing Committee for the reorganization of this company that the plan of agreement dated Aug. 5, 1890, has been agreed to by the holders of more than 90 per cent. of first mortgage bonds and more than 80 per cent. of general mortgage bonds. The time in which security holders may become parties to the plan has expired.

Toledo, Peoria & Western.—It will be gratifying to those who recall the accident at Chatsworth, Ill., and the terrible loss sustained by this company in consequence, to know that its condition and prospects are much improved. By careful management President Leonard has passed the financial crisis which then threatened, and though there has been no rush of business the volume of traffic has so increased as to give the company's affairs a brighter outlook. The equipment has been improved and added to, the bridges are being rebuilt as rapidly as possible, and the wooden culverts, the direct cause of the Chatsworth wreck, are being replaced with stone. During the year ending June 30, 73 wooden bridges and trestles, aggregating 2,772 lineal feet, were rebuilt in stone.

Union Pacific.—The following statement is a summary of the earnings and expenses of this system for July:

	1890.	1889.	Inc. or dec.	
OREGON SHORT LINE & UTAH NORTHERN.				
Month of July:				
Mileage	1,399	1,396	I.	3
Earnings	$699,268	$650,464	I.	$48,804
Expenses	390,337	320,691	I.	69,645
Net earnings	$308,931	$329,773	D.	$20,841
Jan 1 to July 31:				
Earnings	$4,222,828	$3,509,201	I.	$713,627
Expenses	2,783,914	1,974,977	I.	808,937
Net earnings	$1,438,914	$1,534,224	D.	$95,310
OREGON RAILWAY & NAVIGATION CO.				
Month of July.				
Mileage	1,029	875	I.	154
Earnings	$451,549	$404,824	I.	$59,725
Expenses	376,136	259,647	I.	76,489
Net earnings	$128,413	$145,177	D.	$16,764
January 1 to July 31.				
Earnings	$2,330,914	$2,371,932	D.	$41,018
Expenses	2,131,311	1,627,286	I.	504,025
Net earnings	$199,603	$744,646	D.	$545,043
UNION PACIFIC, DENVER & GULF.				
Month of July.				
Mileage	1,386	1,385	I.	1
Earnings	$527,631	$397,287	I.	$130,374
Expenses	338,027	283,633	I.	54,394
Net earnings	$189,634	$113,654	I.	$75,980
January 1 to July 31.				
Earnings	$3,166,308	$2,397,913	I.	$768,395
Expenses	2,207,302	1,921,385	I.	285,917
Net earnings	$959,006	$476,528	I.	$482,478
TOTAL UNION PACIFIC RAILWAY.				
Month of July.				
Mileage	8,028	7,840	I.	188
Earnings	$3,949,335	$3,658,392	I.	$290,943
Expenses	2,330,768	2,056,501	I.	274,267
Net earnings	$1,618,567	$1,601,891	I.	$16,676
Jan. 1 to July 31.				
Earnings	$24,665,270	$21,079,300	I.	$3,585,970
Expenses	16,995,268	13,648,023	I.	3,347,245
Net earnings	$7,670,002	$7,431,277	I.	$238,725

TRAFFIC.

Traffic Notes.

The increased rates on lumber to Texas points is to go into effect Sept. 26.

Mr. Goddard has refused the chairmanship of the new Southwestern Railway & Steamship Association.

The Western Passenger Association is having trouble with the Duluth, South Shore & Atlantic, which is said to be cutting rates from St. Paul to New York.

The Rock Island has decided not to put in force the reduced rates on grain and live stock from Missouri River points until Oct. 17. At latest accounts it proposes to give notice of reduction Oct. 7.

The Evansville & Terre Haute has given notice of its withdrawal from the Indiana Car Service Association, and this has led the Ohio & Mississippi to give a similar notice as far as Vincennes is concerned.

The Philadelphia Car Service Association has complied with the request recently made by the Commercial Exchange that the 48 hour free detention limit be lengthened for mill feed, hay and straw to four days.

Attorney-General Stone, of Iowa, upon the request of the Railroad Commissioners, has filed papers in the District Court for a suit against the Iowa Central, Rock Island, Burlington, St. Paul and other roads to compel them to obey the orders of the Board enforcing joint rates.

The Anoka (Minn.) Board of Trade has made complaint to the Railroad Commissioners of Minnesota against the Great Northern and Northern Pacific, charging those roads with discrimination against Anoka in coal rates from Duluth. A hearing was to have been held Sept. 24.

On the protest of a committee of the Corn and Flour Exchange of Baltimore, the Baltimore & Washington Car Service Association has agreed to give two additional days for hay and straw, making the limit of delay six days. On other commodities the limit was extended from 48 hours to four days.

The Grand Trunk has notified the Toronto Board of Trade that the United States Treasury administrative act is now in operation, and that for shipments of merchandise of the value of $50 and over a consular invoice will be necessary, and a bill of lading indorsed in favor of a customs agent or broker, who will pass the entry at frontier port.

The Committee of Managers to consider the question of speed between Chicago and Western competitive points has formulated its report. The committee does not recommend reducing the number of trains or any material reduction in speed, but suggests an extra fare on fast limited trains. The recommendations are to be submitted Sept. 29.

Rates by lake and rail will be advanced by Oct. 1 by Northwest roads on grain, flour and mill stuffs from Minneapolis to New York, Boston, Philadelphia, Baltimore, Albany and Utica. The advance is from 22½ to 25 cents to New York, 27½ to 30 cents to Boston, 20½ to 23 cents to Philadelphia, 19½ to 22 cents to Baltimore, 22½ to 24½ cents to Albany, and 22½ to 23 cents to Utica. Syracuse, Erie and Buffalo unchanged.

At a meeting held in St. Paul, Minn., last week, attended by representatives of the Northern Pacific, Great Northern, St. Paul & Duluth, Duluth & Iron Range, Chicago, St. Paul & Omaha, and the Lake Superior Terminal & Transfer Co. the Lake Superior Car Service Association was formed, to cover the transfer yards at Duluth and West Superior. James Kelly, who has been given the title of chairman, will have charge of the affairs of the organization.

The Interstate Commerce Commission has held a hearing in New York on the complaint of the New York & Northern against the New York & New England and the Housatonic and the New England Terminal Co. The New York & New England has abolished its through rate over the New York & Northern, compelling shippers to take the Housatonic route, and they allege consequent loss and delay. The case will be further heard in Washington at a full meeting of the Commission.

The Wheat Movement.

The grain carrying roads of the Northwest have completed arrangements for the movement of this year's crop, every car that can be used for carrying wheat being pressed into service. Joint circulars to shippers have been issued, providing for demurrage fees of $3 per day, and perfecting an arrangement by which shippers will take turns in getting cars. The wheat movement this year has been delayed by unfavorable weather for threshing, but the demand for cars will, as usual, be greater than the several roads will be able to supply. The seven so-called granger roads have made estimates of the amount of wheat they will have to move the coming crop season, as follows:

Road	Bushels.
Great Northern	37,000,000
Northern Pacific	17,000,000
Northwestern	16,000,000
Milwaukee & St. Paul	15,000,000
Minneapolis & St. Louis	8,000,000
Omaha	4,000,000
Minneapolis, St. Paul & Sault Ste. Marie	3,000,000
	100,000,000

The Northern Pacific estimate is of wheat east of the Missouri River, a still greater amount being moved West of that point. It is estimated that Eastern Washington will alone furnish 17,000,000 bushels. Averaging 600 bushels of wheat to a car, there will be required to move the Northwestern crop 166,667 cars, or a train 1,136 miles long.

East-bound Shipments.

The shipments of east-bound freight from Chicago by all the lines for the week ending Saturday, Sept. 20, amounted to 70,658 tons, against 72,520 tons during the preceding week, a decrease of 1,862 tons, and against 52,820 tons during the corresponding week of 1889, an increase of 17,838 tons. The proportions carried by each road were:

	W'k to Sept. 20.		W'k to Sept. 13	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	7,434	10.5	8,857	12.2
Wabash	3,603	5.1	4,007	5.5
Lake Shore & Michigan South.	12,065	17.1	12,053	16.6
Pitts., Ft. Wayne & Chicago	7,123	10.1	8,892	12.3
Chicago, St. Louis & Pitts.	11,225	15.9	8,651	11.9
Baltimore & Ohio	4,161	5.9	4,844	6.7
Chicago & Grand Trunk	9,165	12.9	10,642	14.7
New York, Chic. & St. Louis	8,050	11.4	6,695	9.2
Chicago & Atlantic	7,832	11.1	7,879	10.9
Total	70,658	100.0	72,520	100 0

Of the above shipments 1,556 tons were flour, 25,863 tons grain, 2,718 tons millstuffs, 7,573 tons cured meats, 1,991 tons lard, 7,699 tons dressed beef, 1,566 tons butter, 1,865 tons hides, 209 tons wool, and 8,700 tons lumber. The three Vanderbilt lines together carried 38.8 per cent., while the two Pennsylvania lines carried 26.0 per cent. During the week the lake lines carried 87,597 tons, against 67,319 tons during the preceding week. Of the week's shipments 3,420 tons were flour and 78,356 tons grain.